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TECHNICAL MEMORANDUM

TO: Mary Beth Marks – On-Scene Coordinator

FROM: Cam Stringer – Senior Hydrogeologist
Mark F. Pearson – Project Geologist

DATE: January 7, 2004

RE: 2003 McLaren Pit Area Groundwater Monitoring
New World Mining District Response and Restoration Project

INTRODUCTION

This technical memorandum presents the results of biweekly groundwater monitoring completed by Maxim Technologies, Inc.® (Maxim) in the McLaren Pit area during the 2003 field season. Biweekly monitoring was conducted according to the scope and methods described in the 2003/2004 Work Plan for the New World Mining District Response and Restoration Project (Maxim, 2003a). Biweekly measurements of depth to water, pH, specific conductance (SC), dissolved oxygen (DO) concentrations, and oxidation/reduction potential (ORP) were collected during the period beginning in July 2003 and ending in early October 2003. Groundwater samples were also collected in early July for laboratory analysis of dissolved metals, common ions, and other parameters. Also presented in this memorandum are activities associated with the installation and monitoring of four additional McLaren Pit area monitoring wells.

References are listed at the end of the memorandum. Figures and tables are presented in **Attachments A and B**, respectively, and well logs for the four new monitoring wells are contained in **Attachment C**. **Figure 1 (Attachment A)** shows well locations, surface water monitoring sites, and other features important to discussions presented in this memorandum.

PREVIOUS INVESTIGATIONS

Water sampling and analysis performed by Crown Butte Mines, Inc., (CBMI), various consultants, and state and federal agencies over the last 15 years has clearly documented groundwater and surface water contamination associated with mine wastes and other sources in the headwater areas of both Daisy Creek and Fisher Creek (Maxim, 2001; 2002a). Mass load analyses by Nimick and Cleasby (2001) in the Daisy Creek drainage helped refine the conceptual model of contaminant transport. This study documented the location of contaminant inflows from tributaries into the main stem of Daisy Creek, and, based on calculated increases in contaminant loads between adjacent surface water sampling stations, concluded that contaminated groundwater is discharging to Daisy Creek at certain locations. In 2001, Maxim, in cooperation with the New World Mining District Response and Restoration Project hydrogeology technical group, developed additional hydrogeologic investigations to help identify the

nature and extent of contamination in the shallow groundwater system inclusive of colluvium (previously referred to as till or glacial till) and underlying bedrock. An analysis of the deeper bedrock groundwater systems in the McLaren Pit area was also undertaken. These activities continued in the field season of 2003.

Groundwater investigations in the McLaren Pit area confirmed that groundwater movement is fracture controlled in bedrock, and that colluvium-hosted groundwater and shallow, underlying, bedrock-hosted groundwater are similar and in direct hydraulic communication (Maxim, 2003b). Three general stratigraphic zones have been identified in the McLaren Pit area that comprise the shallow groundwater system:

- 1) Oxidized glacial colluvium
- 2) Reduced colluvium
- 3) Underlying bedrock

Groundwater occurrence in many of the wells in the McLaren Pit area appears to be at or near the contact between colluvium and bedrock. Grain size and transmissivity of colluvium was observed to increase downslope of the McLaren Pit, and surface water appears to recharge groundwater downslope of the McLaren Pit. Groundwater recharge is possible due to a downslope coarsening of colluvium and a downslope decrease in lithic (ferricrete) deposits (Furniss et. al., 1999) lining surface water channels draining the McLaren Pit area.

Groundwater quality in and adjacent to the McLaren Pit is poor due to the presence of high concentrations of dissolved metals and sulfate. Groundwater investigations in 2002 identified a plume of low pH groundwater that was traced from the McLaren Pit downslope through the area known as the manganese bog (**Figure 1**). Surface water streams draining the McLaren Pit area were of lower quality than shallow groundwater. Groundwater in colluvium downslope of the McLaren Pit appeared to be of lower quality compared with groundwater in underlying bedrock. In two of the colluvium-bedrock well pairs sampled during 2002, higher manganese concentrations occur in colluvium-hosted groundwater and higher iron concentrations occur in bedrock-hosted groundwater. Acidic surface water flows with elevated SC originate from the McLaren Pit area and appear to recharge groundwater downslope. Downslope wells adjacent to these streams (DCGW-132 and DCGW-133) have the highest dissolved metal concentrations other than wells screened in the McLaren Pit waste rock (DCGW-104 and DCGW-105). Spatial analysis of water quality parameters and metals concentrations in the McLaren Pit area suggest that a zone of more transmissive colluvium and fractured shallow bedrock associated with Crown Butte fault may be a preferential pathway for contaminant transport in bedrock downslope of the McLaren Pit (Maxim, 2003b).

METHODS

Monitoring well installation, biweekly groundwater monitoring, and groundwater and surface water sampling were conducted according to methods and procedures outlined in the 2003/2004 Work Plan (Maxim, 2003a) and the Site-Wide Sampling and Analysis Plan (Maxim, 1999). Groundwater monitoring was conducted during the period that the McLaren Pit cover system was being constructed. Water

quality samples were collected before the geosynthetic liner was in place. Construction of the cover was completed in late October 2003 after the final biweekly monitoring event.

MONITORING WELL INSTALLATION

Four monitoring wells (DCGW-100, -111S, -111D, and -112; **Figure 1**) were installed in the McLaren Pit area during 2003 to enhance the groundwater monitoring network. Well DCGW-100 was installed as a background bedrock monitoring well completed in the Meagher Limestone Formation upgradient of the McLaren Pit to determine water quality from an area unaffected by mining. The pair of wells DCGW-111S and -111D were installed to permit monitoring of bedrock and colluvium water quality southwest (down-dip) of the mined pit and waste rock but on the upthrown side of the Crown Butte Fault. The other well, DCGW-112, was installed to allow monitoring of groundwater in bedrock downgradient of the pit, but on the downthrown side of the fault.

Monitoring wells were drilled and completed using an air rotary drilling rig. A Maxim geologist observed continuous drill cuttings and recorded lithologic descriptions on field logs. Wells were completed with 5-centimeter (2-inch) diameter polyvinyl chloride (PVC) casing with 3 to 15 meters (10 to 50 feet) of factory-slotted, 0.05-centimeter (0.020-inch) well screen. The annular space between the borehole wall and the well screen was filled with 10-20 grade silica sand across the screened interval and a bentonite plug with a minimum thickness of 0.6-meter (two feet) was placed on top of the sand pack. The remaining annular space to within 0.6 meters (two feet) of the surface was filled with drill cuttings and bentonite. A 15-centimeter (6-inch) diameter steel casing well protector was set at the surface.

GROUNDWATER MONITORING

Groundwater monitoring was conducted biweekly between early July and early October 2003. Depth to groundwater was measured in monitoring wells using a decontaminated electric water level indicator. Field parameters including pH, SC, ORP, and DO were measured in groundwater samples obtained from monitoring wells using a YSI 556 downhole multiprobe. Generally, the multiprobe was lowered into the water column of the well after two casing volumes of water were purged from each monitoring well. Some exceptions to this method were made based on specific field conditions: 1) For deep wells with a relatively large purge volume, downhole measurements were collected without purging; 2) In wells where depth to groundwater exceeded the length of the multiprobe cable (20 meters), a sample was collected using a bailer and measurement of field parameters was conducted at the surface. Other exceptions to standard sampling and purging procedures are noted in **Table 1 (Attachment B)**.

Groundwater samples were collected from monitoring wells during early July 2003. Surface water samples in the McLaren Pit area were collected once in early July and once in early October 2003. Samples were shipped to Northern Analytical Laboratories, Inc., in Billings, Montana for laboratory analysis of dissolved metals, common ions, pH, and SC.

RESULTS

Discussed below are results of well installation, and groundwater and surface water monitoring completed in the McLaren Pit area during 2003. Figures are presented in **Attachment A**. Tabulated data and the project water quality database are presented in **Attachment B**. Lithologic and completion logs for four wells installed in 2003 are contained in **Attachment C**.

For brevity in the following discussion, the prefix used in the well designation for the series of wells beginning with the number 100, DCGW, is not used. These wells were installed in 2002 and 2003. Wells installed by the EPA and CBMI in the mid-'90's (EPA-6, Tracer 2, MW-2, and MW-3) are referred to with their complete well designation.

WELL INSTALLATION

Monitoring well 100 was designed to sample groundwater within the Meagher Limestone upgradient of the McLaren Pit. The well was installed to a total depth of 72 meters (235 feet) and is screened from 56 to 72 meters (185 to 235 feet) below ground surface. Park Shale was encountered in the upper 50 meters (165 feet) of the borehole. Meagher Limestone was encountered between 50 and 72 meters (165 and 235 feet) below ground surface. Two days after well completion, depth to groundwater was approximately 28 meters (91 feet) below the casing collar.

Paired wells 111S and 111D were installed at the downslope limit of the McLaren Pit reclamation area and are screened in colluvium and Wolsey Shale, respectively. Well 111S was completed at a total depth of seven meters (23 feet) in colluvium and was screened from four to seven meters (13 to 23 feet). Saturated cuttings were observed in the bottom of the borehole. Five days after well completion, groundwater was measured at approximately 1.2 meters (four feet) below the casing collar. Well 111D was drilled eight feet from well 111S through six meters (20 feet) of colluvium into six meters (20 feet) of underlying Wolsey Shale. The greatest moisture content during drilling of well 111D was observed at the contact between the colluvium and the shale at a depth of six meters (20 feet) below ground surface. The well is screened from 7.6 to 12.2 meters (25 to 40 feet) below ground surface. Six days after well completion, depth to groundwater was approximately 3.4 meters (11 feet) below the casing collar.

Well 112 was installed to a total depth of 10.7 meters (35 feet) and is screened from 7.6 to 9.1 meters (25 to 30 feet) below ground surface. The well was drilled through 4.3 meters (14 feet) of colluvium into the underlying rhyodacite porphyry. One day following well completion, depth to groundwater was approximately 2.3 meters (7.5 feet) below the casing collar.

GROUNDWATER ELEVATIONS AND FLOW

Figure 2 (Attachment A) is a potentiometric surface map for the shallow colluvial groundwater system below the McLaren Pit based on July 7 to 10, 2003 depth to water data. Groundwater flow in the shallow groundwater system is generally perpendicular to the slope, as was observed in 2002, turning westerly near Daisy Creek (**Figure 2**). The hydraulic gradient is approximately 0.30 between

wells 131 and 107 and approximately 0.14 along Daisy Creek between wells 107 and 102S. Generally, the gradient increases where the slope becomes steeper below the McLaren Pit, then decreases in the downslope area (near wells 110, 134, 137, 138).

Water levels in the shallow groundwater system in colluvium and shallow bedrock wells declined from July through early October 2003 (**Figure 3, Attachment A**) following seasonal recharge from spring runoff. The water table elevation dropped below the screened interval of wells 108 and 135 during August. Groundwater elevations in bedrock wells also dropped between July and October (**Figure 3**).

Paired wells 101S and 101D; 102S and 102D; 103S and 103D; and 111S and 111D were designed to allow comparison of groundwater elevations and groundwater quality between shallow bedrock and overlying colluvium. Vertical hydraulic gradients are upward at well pairs 101 and 103 based on higher groundwater elevations measured in the deeper bedrock well relative to elevations measured in adjacent shallow colluvial wells. Vertical gradients are downward at well pairs 102 and 111 based on higher groundwater elevations measured in colluvial wells relative to elevations measured in adjacent bedrock wells.

GROUNDWATER QUALITY

Discussion of groundwater quality results is presented in this section. This discussion is supported by figures and tables presented in the following attachments.

- 1) Field parameter data for McLaren Pit area monitoring wells are presented in **Table 1 (Attachment B)**. Common ion and dissolved metal analytical data for McLaren area monitoring wells are presented in **Table 2**.
- 2) **Figures 4 through 10 (Attachment A)** are isopleth maps for several water quality parameters. Maps for pH and SC are based on mean 2003 values. Maps for ORP and DO are based on mean 2003 values with a consistent monitoring method (**Table 1**). Data used for the preparation of dissolved iron, dissolved copper, and sulfate maps are July 2003 analytical results (**Table 2**).
- 3) **Figure 11 (Attachment A)** presents a series of graphs showing trends in pH, ORP, and SC for specific wells.
- 4) **Figure 12 (Attachment A)** compares water quality parameters in selected shallow wells with water quality in tributary DCT-8.

Meagher Background Well and Deep Bedrock Wells

Analytical data (**Tables 1 and 2**) from well 100 indicate that groundwater quality in the Meagher Limestone upgradient of the McLaren Pit is of relatively good quality and does not show evidence of impacts from mineralized sources. The groundwater sample collected from well 100 contained near neutral pH, and relatively low total dissolved solids concentrations. The only dissolved metals detected in the sample from this well were relatively low concentrations of iron and manganese. Concentrations

of constituents in bedrock wells Tracer 2 and MW-2 were similar to those reported in previous years sampling results (Maxim, 2003c; 2002b).

Groundwater Quality Characteristics

The downslope portion of the shallow groundwater system including wells 101S, 108, 109, 110, and 134 through 137 is an area of relatively good water quality. This area has a mean pH greater than 4 standard units (s.u.) (**Figure 4**), mean SC less than 1,000 microsiemens (μ S) (**Figure 5**), mean DO greater than 1.8 milligrams per liter (mg/L) (**Figure 6**), dissolved iron less than 4 mg/L (**Figure 8**), and sulfate less than 400 mg/L (**Figure 9**). These wells are screened in oxidized colluvium. Mean DO ranged between 3.3 to 8.7 mg/L in wells 101, 108, and 134 through 137. This range is probably a reflection of the shallow groundwater system being recharged with surface water. Similarly, DO concentrations greater than 7.0 mg/L in well 138 indicate that this area is likely recharged with surface water.

As was observed in 2002 (Maxim, 2003b), a zone of shallow groundwater exhibiting relatively low pH and high SC, sulfate, and metals concentrations extends from the McLaren Pit (wells 104 and 105), downslope toward the Crown Butte fault. This zone of poor quality groundwater then parallels the fault in the vicinity of wells 133 and 132 and continues to the manganese bog. The McLaren Pit is the source of acidic and metals laden groundwater in this zone that is caused by oxidation of pyrite and other sulfide minerals (Maxim 2001). This zone of contaminated shallow groundwater was further defined with the installation and monitoring in 2003 of well pair 111S/111D and well 112.

Monitoring data collected in 2003 indicate that the narrow zone of impacted groundwater is associated with Daisy Creek tributaries draining from the McLaren Pit. Isopleth maps for pH, ORP, iron, and copper (**Figures 4, 6, 8 and 9**) indicate that this zone is defined by wells within 20 meters of tributary DCT-8. Water samples collected from DCT-8 exhibit low pH and contain relatively high metals concentrations (discussed further below). These data suggest that water draining from McLaren Pit waste rock into tributary DCT-8 may leak from the stream channel further downslope, serving as a major source of low pH and high metals and sulfate concentrations to the shallow groundwater system. However, isopleth maps for SC and sulfate (**Figures 5 and 10**) demonstrate that a more widespread source area upslope from tributary DCT-8 contributes sulfate and other dissolved ions that are then transported through shallow groundwater flow toward the Crown Butte fault and the manganese bog.

Oxidation Reduction Potential (ORP) Trends

Shallow groundwater flowing beneath the McLaren Pit toward the Crown Butte fault exhibits relatively high ORP (wells 104, 105, and 133, **Figure 6**). Groundwater in this zone of relatively high ORP also contains low dissolved oxygen concentrations, suggesting that iron⁺² and iron⁺³ are controlling the ORP (Garrels and Christ 1965). Other ORP sensitive metals may also affect ORP measurements but to a lesser degree (Krauskopf 1967). The ORP values in this area appear to be highest where pH is lowest and dissolved iron concentrations are highest. This relationship does not appear applicable in downslope wells west of the Crown Butte fault (wells 101, 108, and 136, **Figure 6**). DO concentrations (**Figure 7**) are variable and cannot be correlated with the zone of poor groundwater quality.

Seasonal Trends in Field Parameter Data

Figure 11 is a series of graphs showing trends in pH, ORP, and SC between July and October 2003 in wells 104, 105, 132, and 133. These wells are completed in the shallow groundwater system within the zone of low pH, high metals, and high sulfate concentrations that extends from the McLaren Pit to the manganese bog. Groundwater levels in these wells declined during this period (**Figure 3**).

Figure 11 shows that between July and October 2003, pH increased in groundwater in the McLaren Pit waste rock (wells 104 and 105) and decreased in the downslope contaminated groundwater zone around wells 132 and 133. During this same period, ORP decreased in wells 104 and 105 and increased in well 132. Increasing pH and decreasing ORP in shallow groundwater in the pit wells indicates that groundwater flushing of the McLaren Pit waste rock during spring runoff removes available acidity and metal salts in the vadose zone. During spring runoff in the McLaren Pit, pH is lower and iron is more soluble, resulting in an increase in iron concentrations and ORP. With the lowering of the water table following spring runoff, acidity and available metal salts are flushed from grain surfaces, resulting in an increase in pH and alkalinity in groundwater in the McLaren Pit waste rock material. As pH increases with falling groundwater elevations, iron precipitates and ORP decreases.

Downgradient of the McLaren Pit near wells 132 and 133, pH decreases following spring runoff as acidity and dissolved metal salts are transported downgradient. Another indication of the movement of poor quality water downslope as the season progresses is the corresponding increase in SC measured in wells 133 and 134 during the monitoring period.

Paired Well Completion Observations

Monitoring of paired wells 101S and 101D, 102S and 102D, 103S and 103D, and 111S and 111D noted some relative water quality differences in colluvium-hosted and bedrock-hosted groundwater. Groundwater in shallow bedrock at well 101D exhibits higher pH, SC, total alkalinity, iron, and manganese levels, and lower DO, ORP, aluminum, cadmium, lead, and zinc levels than groundwater in the overlying colluvium at well 101S (**Tables 1 and 2**). During 2003, pH declined in well 101D and DO declined in 101S and 101D.

Values of pH, SC, and DO measured in groundwater samples from paired wells 102S and 102D during 2003 were similar (**Table 1**). During 2003, pH generally declined in well 102S and DO declined in both wells 102S and 102D. The sample collected from well 102S exhibited higher aluminum, cadmium, copper, iron, lead, and manganese concentrations compared with the sample from well 102D (**Table 2**).

Iron and manganese concentrations and pH were slightly higher and SC and DO were lower in the groundwater sample from well 103D than in the sample from well 103S (**Table 2**). The groundwater sample from well 103S exhibited higher cadmium and zinc concentrations compared with the sample from well 103D (**Table 2**).

The groundwater sample from well 111D exhibited lower values of SC, DO, and zinc and higher aluminum, copper, iron and lead concentrations than the sample from well 111S (**Tables 1 and 2**). Between July and October 2003, ORP increased and DO concentrations decreased in well 111S.

GROUNDWATER-SURFACE WATER INTERACTIONS

Work completed in 2002 led to the conclusion that significant contaminant loading to Daisy Creek comes from contaminated surface water tributaries originating in the McLaren Pit area, and discrete zones of preferential flow of contaminated groundwater through shallow colluvial material. Bedrock groundwater quality is relatively good, and most shallow wells screened in colluvium are only moderately impacted relative to surface water in the tributaries (e.g. DCT-8 and DCT-9), Daisy Creek, and select zones of preferential groundwater flow in shallow colluvium (Maxim, 2003b). Monitoring conducted in 2003 has confirmed this model.

Results of surface water monitoring conducted in 2003 are summarized in **Table 3**. Station DCT-7 is located on a tributary draining the basin east of the McLaren Pit and west of Daisy Pass. Stations DCT-8, DCT-9, and USGS-1700 are located on downstream reaches of streams draining the McLaren Pit and adjacent area. Station DCT-8 is located on the downstream reach of streams that drain the central portion of the McLaren Pit and the tributary streams to this station are most closely aligned with the zone of shallow groundwater having low pH and high metals and sulfate concentrations discussed previously.

Surface water flows measured in tributaries on July 9, 2003 ranged from 0.03 cubic feet per second (cfs) at station DCT-8 to 1.11 cfs at station DCT-9. Flow in Daisy Creek at station USGS 1700 was 0.83 cfs on July 9, 2003. Flowing water was not observed at stations DCT-9 and USGS 1700 on October 1, 2003. Between the July and October 2003 monitoring events, flow at DCT-7 had decreased to 0.05 cfs and flow at station DCT-8 had decreased to 0.03 cfs. These data support the model that surface water tributaries in downslope areas are losing reaches that recharge shallow groundwater.

Analytical results from the July 2003 monitoring indicate that surface water quality at station DCT-7 is relatively un-impacted, having a near neutral pH and SC below 340 μ S (**Table 3**). Surface water in tributaries at stations DCT-8, DCT-9, and USGS-1700 is acidic (pH at or less than 3.5 s.u.) with SC values greater than 400 μ S. Except for lead in the sample from station USGS 1700, surface water at station DCT-8 contained the highest metals and sulfate concentrations of these four tributaries.

The 2003 surface and groundwater water quality data suggest that DCT-8 is an important pathway for the transport of water with low pH and high metals concentrations from McLaren Pit waste rock into shallow groundwater, ultimately discharging to the manganese bog and Daisy Creek. Comparison of pH, sulfate, SC, and metals concentrations measured in groundwater samples from wells 104, 105, 132, and 133 to the July 9, 2003, sample from tributary DCT-8 demonstrates that groundwater quality in this zone is equivalent to surface water quality at station DCT-8 (**Figure 12**). Metals concentrations increased at station DCT-8 between the July and October 2003 monitoring events, coincident with the observed decrease in pH in groundwater at wells 132 and 133.

SUMMARY AND CONCLUSIONS

Relationships between groundwater field parameters indicate several geochemical interactions may be occurring in different areas. The relationship between ORP and DO indicates that chemical changes in iron may affect these two parameters the most, depending on the location of shallow wells in relation to the zone of poor groundwater quality.

Seasonal trends in pH and ORP in waste rock wells 104 and 105 show a flushing effect of acidity and metal salts from the McLaren Pit waste rock that results in improving groundwater quality through the season. Seasonal trends in these same parameters in downgradient wells located in the zone of poor groundwater quality suggest that these flushed contaminants move through this zone in late summer and fall.

Based on observations of groundwater quality in paired wells, bedrock-hosted groundwater is generally of better quality than colluvium hosted groundwater, especially in the zone of poor quality groundwater, although this statement is not true for all contaminants in all four well pairs. Colluvial wells generally had higher DO and ORP values, indicating the influence of surface water (higher levels of oxygen) on the shallowest water-bearing unit. For the three shallow bedrock wells below the McLaren Pit (101D, 103D, and 111D), iron concentrations were higher than in groundwater from the paired colluvial well.

Work completed in 2002 led to the conclusion that significant contaminant loading to Daisy Creek comes from contaminated surface water tributaries originating in the McLaren Pit area, and discrete zones of preferential flow of contaminated groundwater through shallow colluvial material. This Model was confirmed by monitoring in 2003. Tributary DCT-8 and a zone of more transmissive colluvium and fractured shallow bedrock associated with the Crown Butte Fault appear to be the primary conduits controlling transport of metals from the McLaren Pit to groundwater and ultimately to the manganese bog and Daisy Creek. Tributary DCT-8 drains impacted water from McLaren Pit waste rock that recharges shallow groundwater downgradient, affecting groundwater quality near the tributary. Constituents such as sulfate and SC appear to be more widespread in groundwater below the McLaren Pit. Impacted shallow groundwater flowing in colluvium downgradient is inferred to be redirected along the Crown Butte Fault, which seems to serve as a preferential pathway transporting contaminants to the manganese bog and Daisy Creek.

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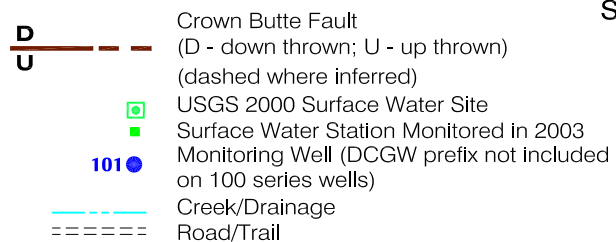
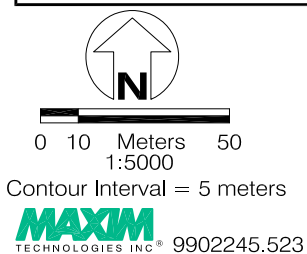
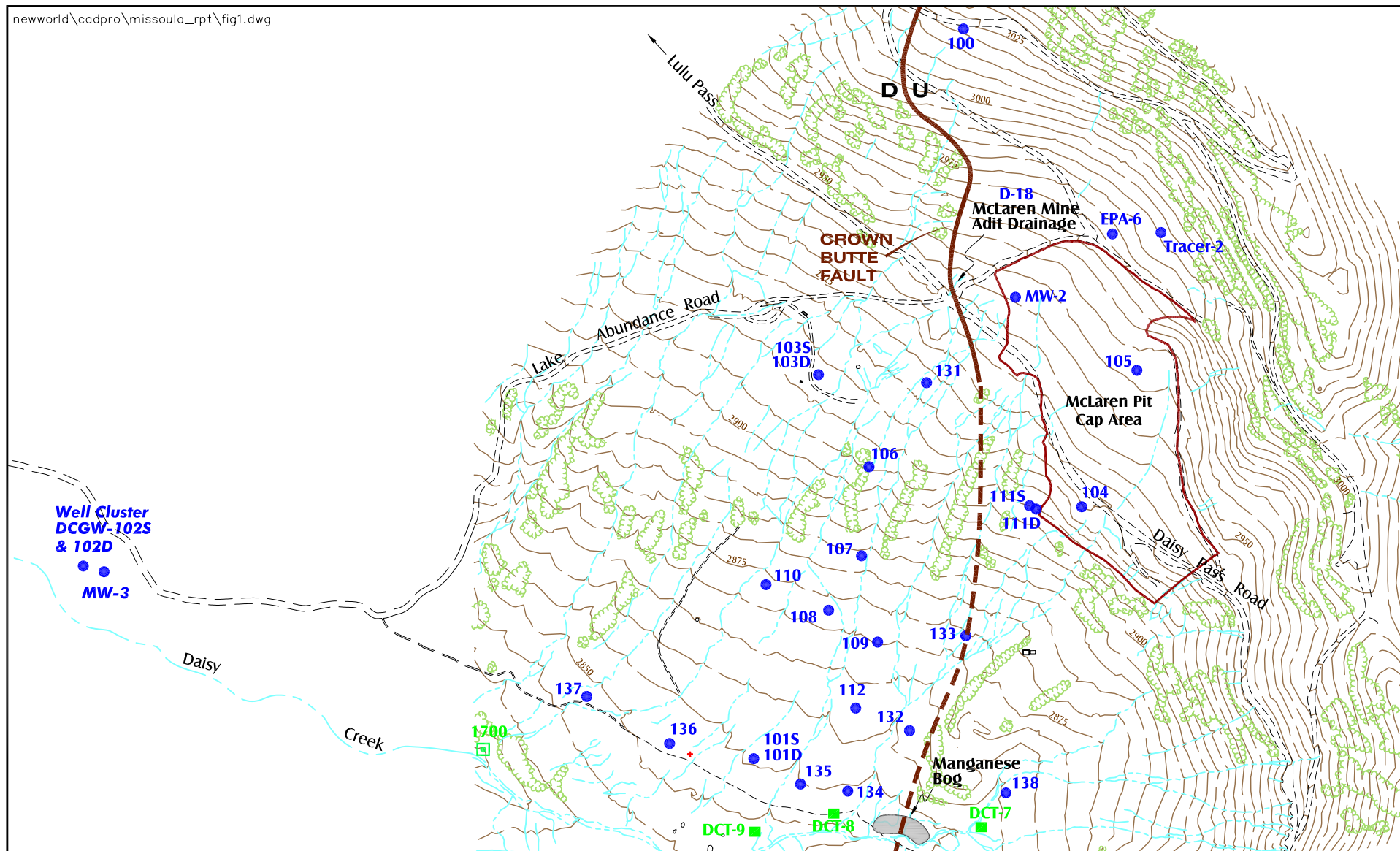
ATTACHMENT A

FIGURES

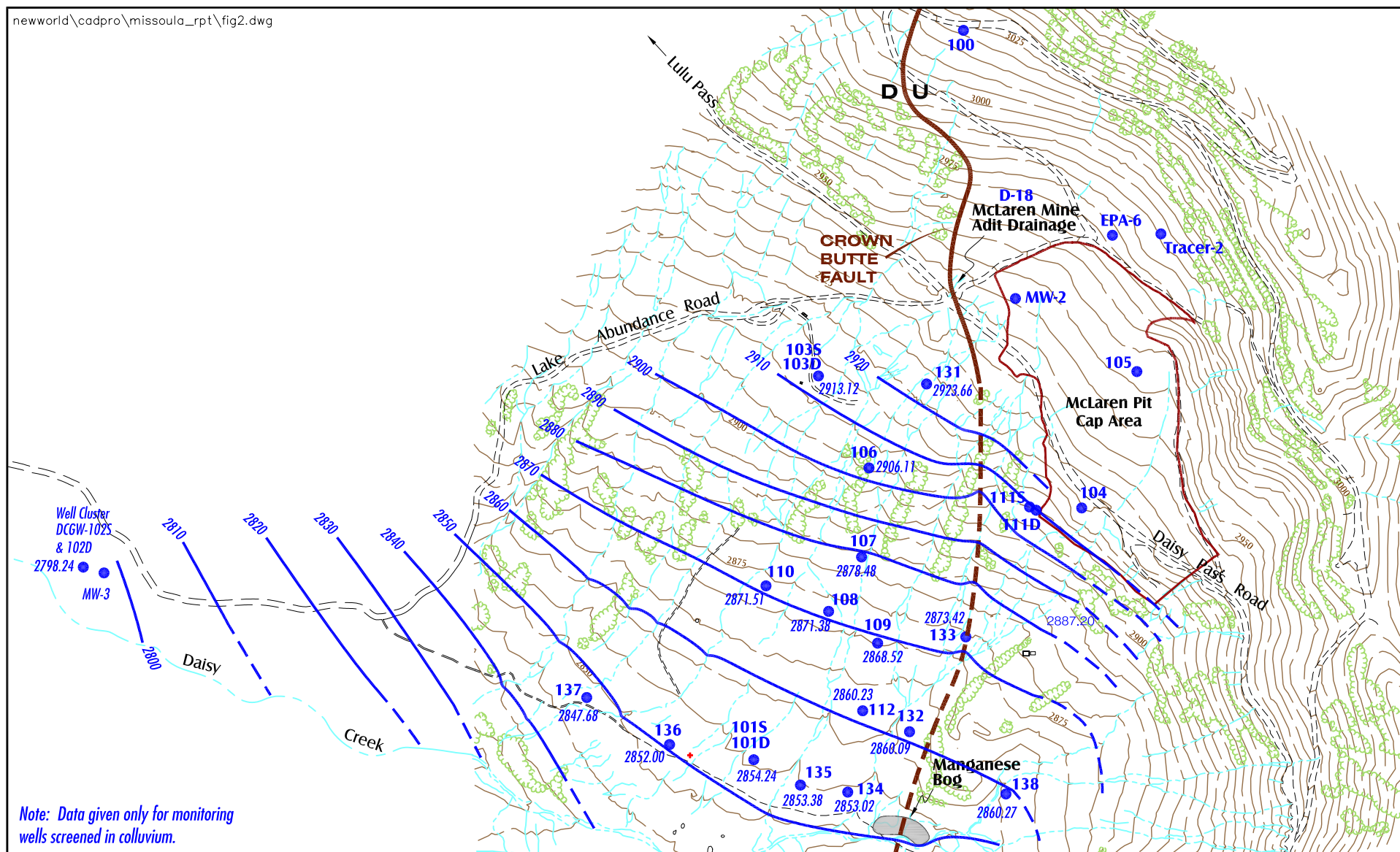
McLaren Pit Area 2003 Biweekly Groundwater Monitoring *New World Mining District Response and Restoration Project*

Figure

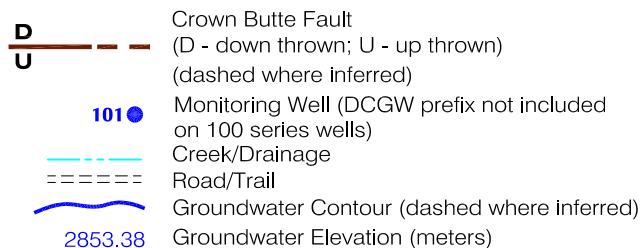
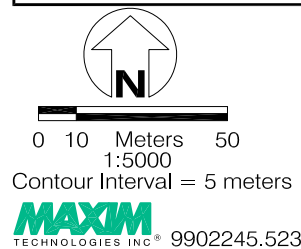
- 1 Surface Water and Groundwater Monitoring Locations, 2003 Field Season, McLaren Pit Area
- 2 July 2003 Groundwater Elevation Data, McLaren Pit Area
- 3 Groundwater Hydrographs for 2003 in Select Wells, McLaren Pit Area
- 4 Isopleth Map of Mean pH in Shallow Groundwater, July 2003, McLaren Pit Area
- 5 Isopleth Map of Mean Specific Conductance in Shallow Groundwater, July 2003, McLaren Pit Area
- 6 Isopleth Map of Mean Oxidation Reduction Potential in Shallow Groundwater, July 2003, McLaren Pit Area
- 7 Isopleth Map of Mean Dissolved Oxygen in Shallow Groundwater, July 2003, McLaren Pit Area
- 8 Isopleth Map of Dissolved Iron in Shallow Groundwater, July 2003, McLaren Pit Area
- 9 Isopleth Map of Dissolved Copper in Shallow Groundwater, July 2003, McLaren Pit Area
- 10 Isopleth Map of Sulfate in Shallow Groundwater, July 2003, McLaren Pit Area
- 11 pH, ORP, and SC Trends for 2003 in Shallow Wells within the Zone of Poor Water Quality, McLaren Pit Area
- 12 Comparison of Selected Constituent Concentrations Between Selected Shallow Wells and Station DCT-8, McLaren Pit Area



Surface Water and Groundwater Monitoring Locations
2003 Field Season
McLaren Pit Area
New World Mining District
Response and Restoration Project
Cooke City Area, Montana
FIGURE 1



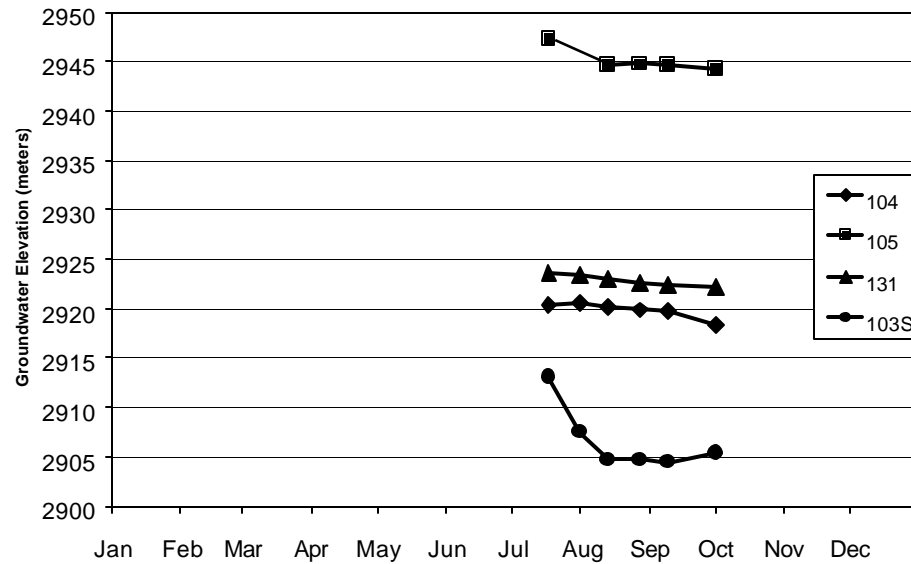
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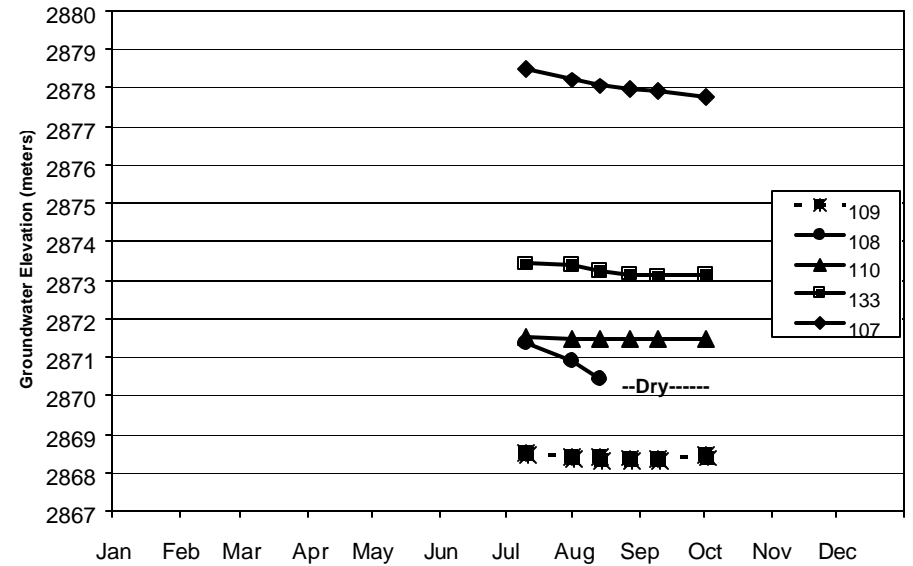
July 2003 Groundwater Elevation Data
McLaren Pit Area
New World Mining District
Response and Restoration Project
Cooke City Area, Montana

FIGURE 2

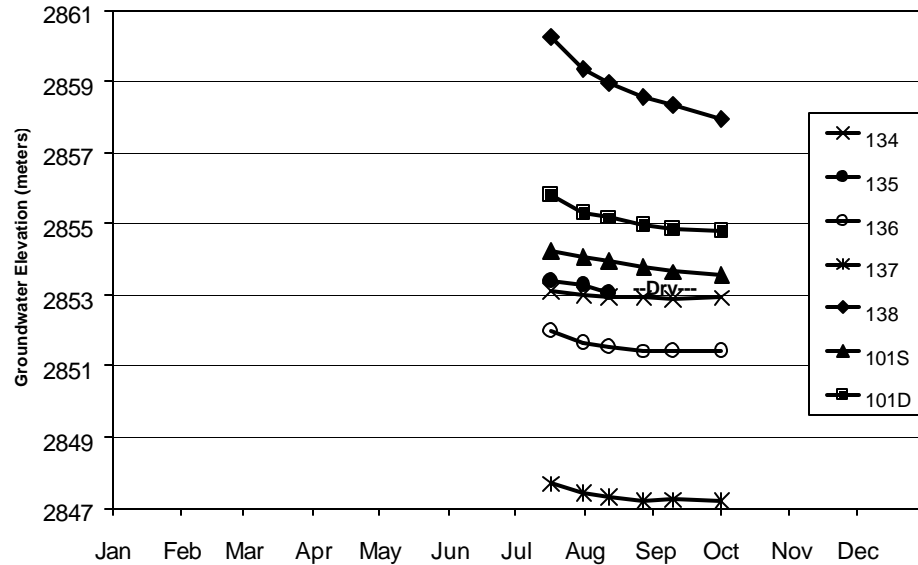
UPSLOPE WELLS



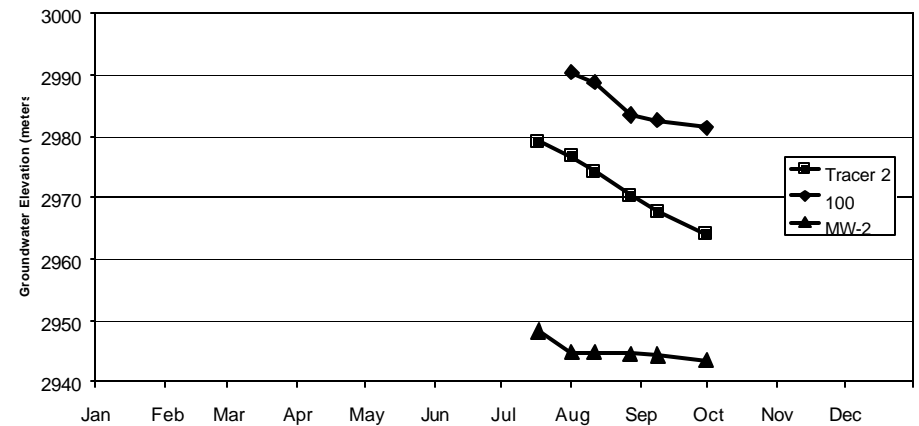
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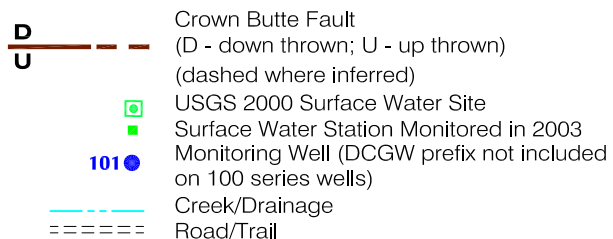
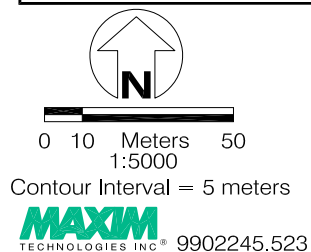
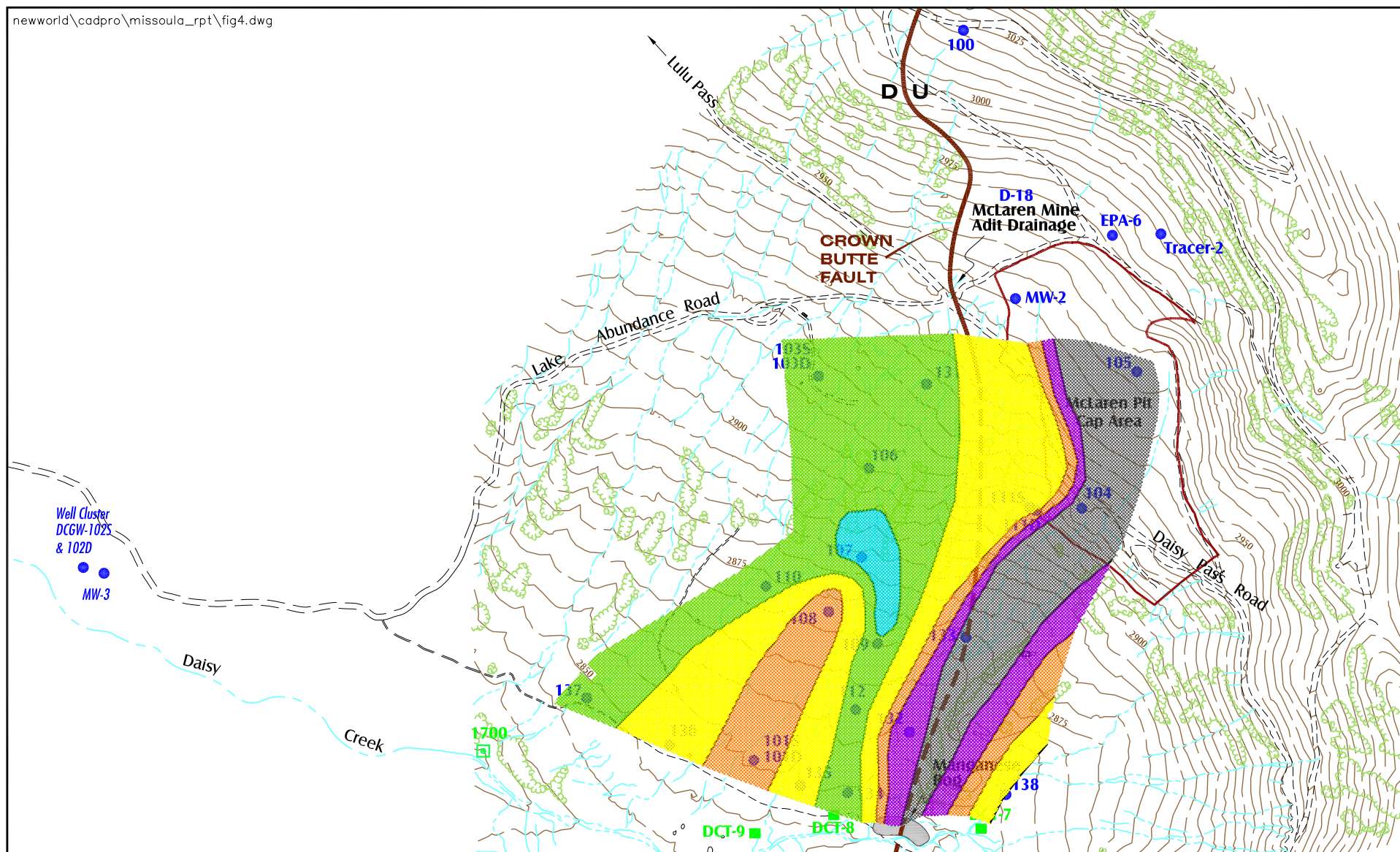
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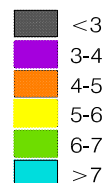
BEDROCK WELLS



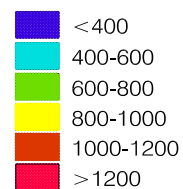
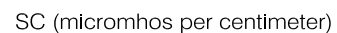
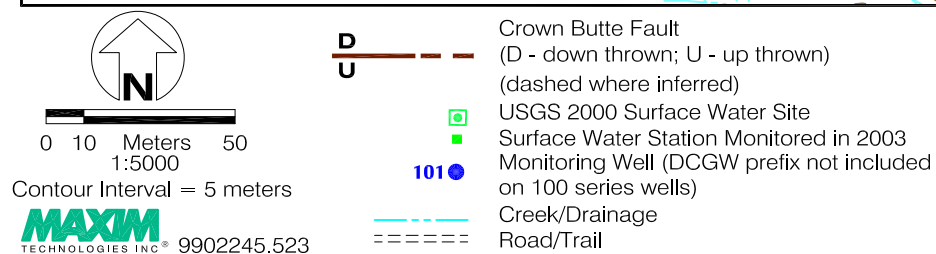
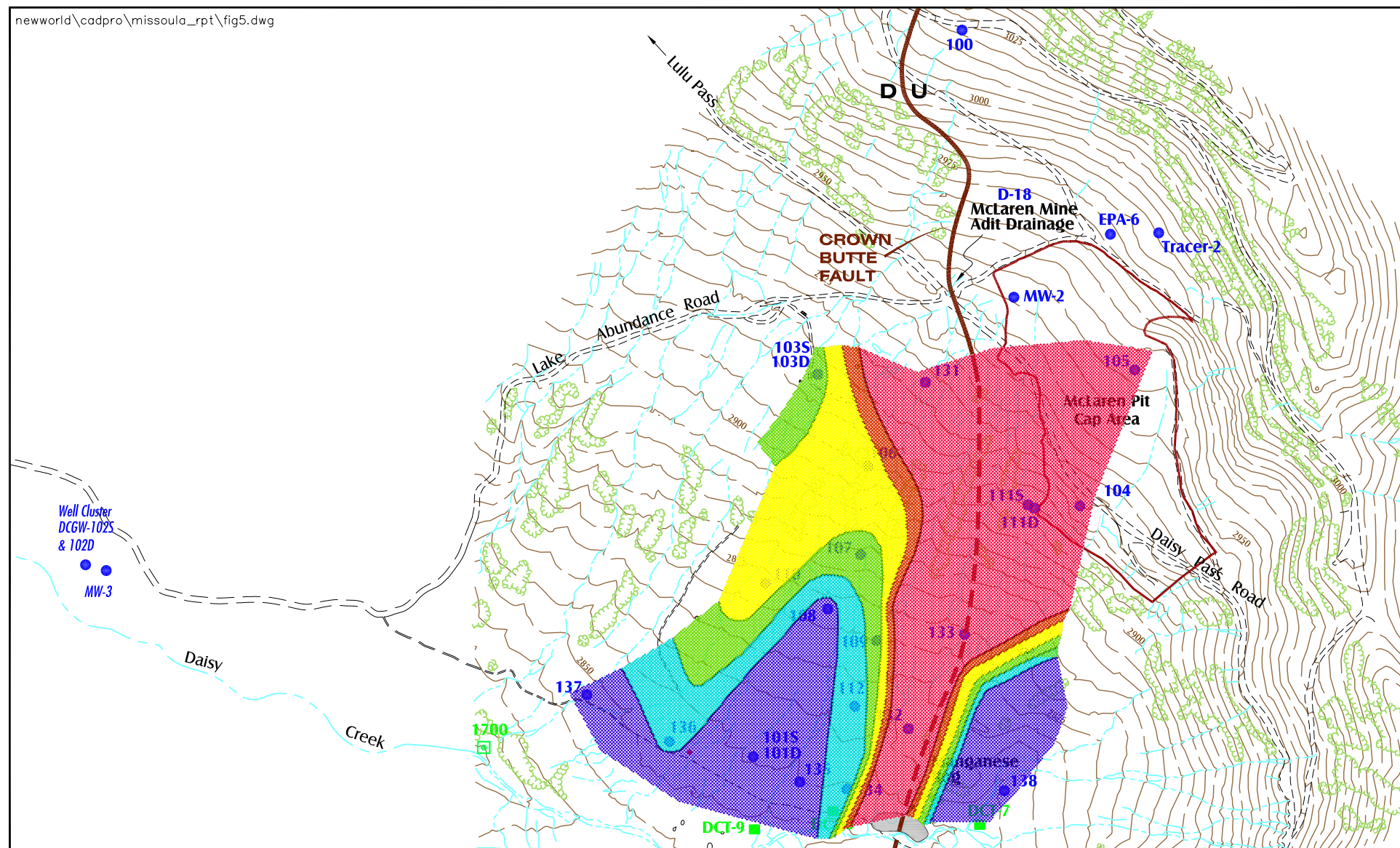
Groundwater Hydrographs for 2003 in Select Wells
McLaren Pit Area
FIGURE 3



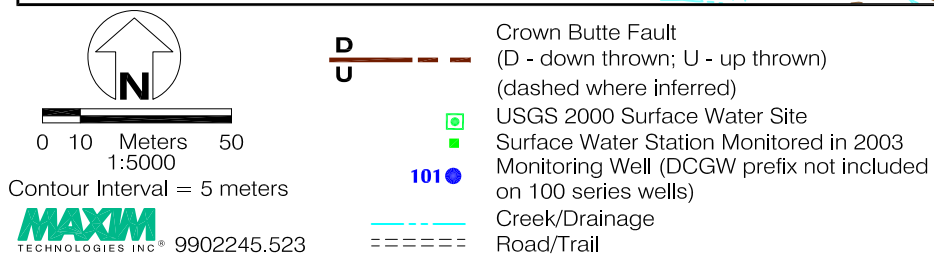
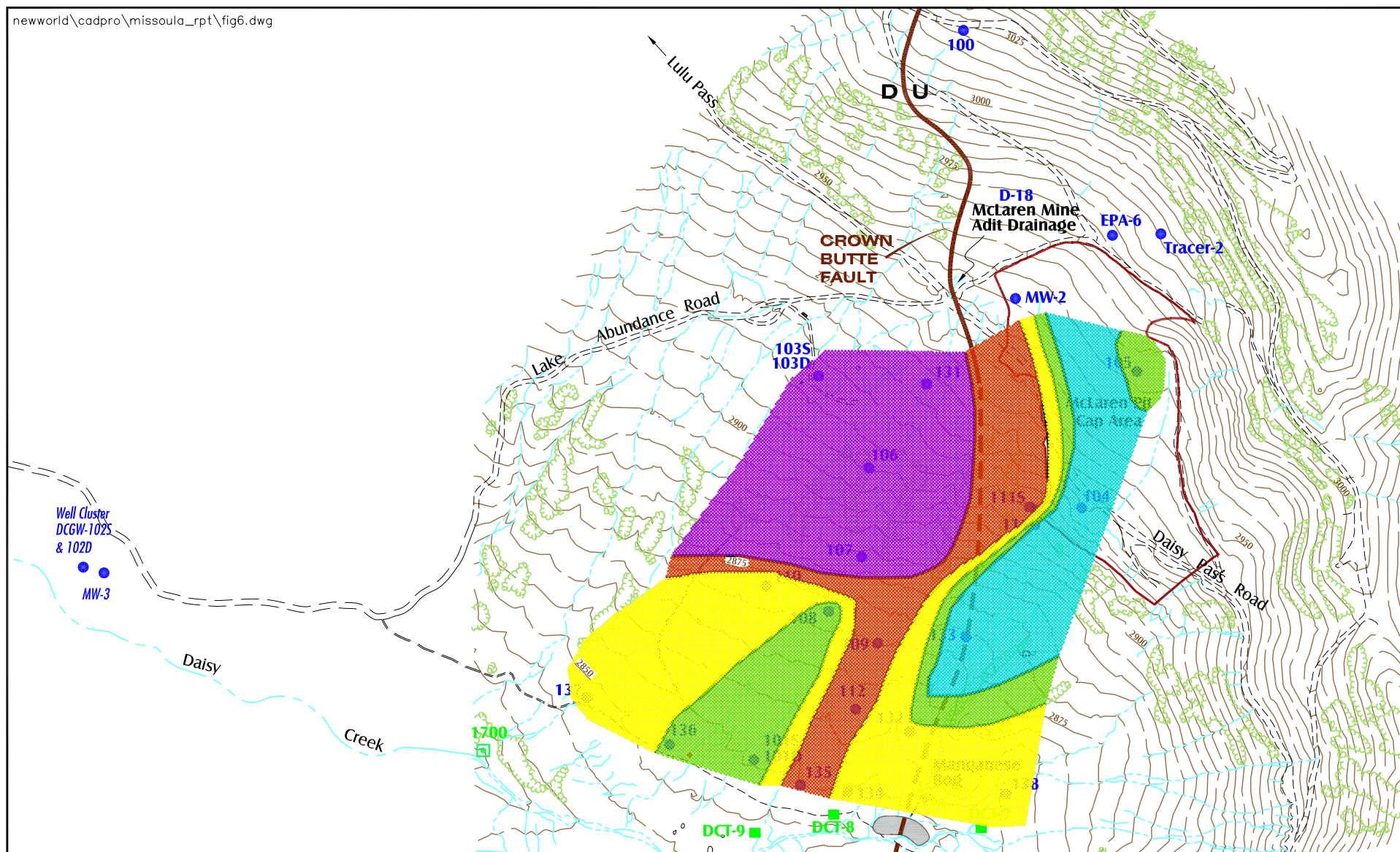
pH (Standard Units)



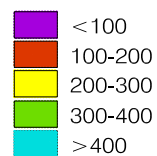
Isopleth Map of Mean pH
In Shallow Groundwater - July 2003
McLaren Pit Area
New World Mining District
Response and Restoration Project
Cooke City Area, Montana
FIGURE 4



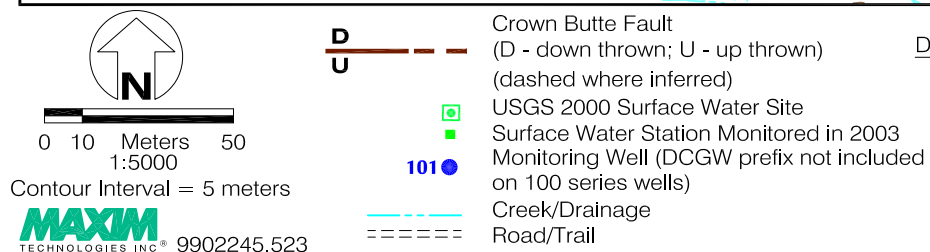
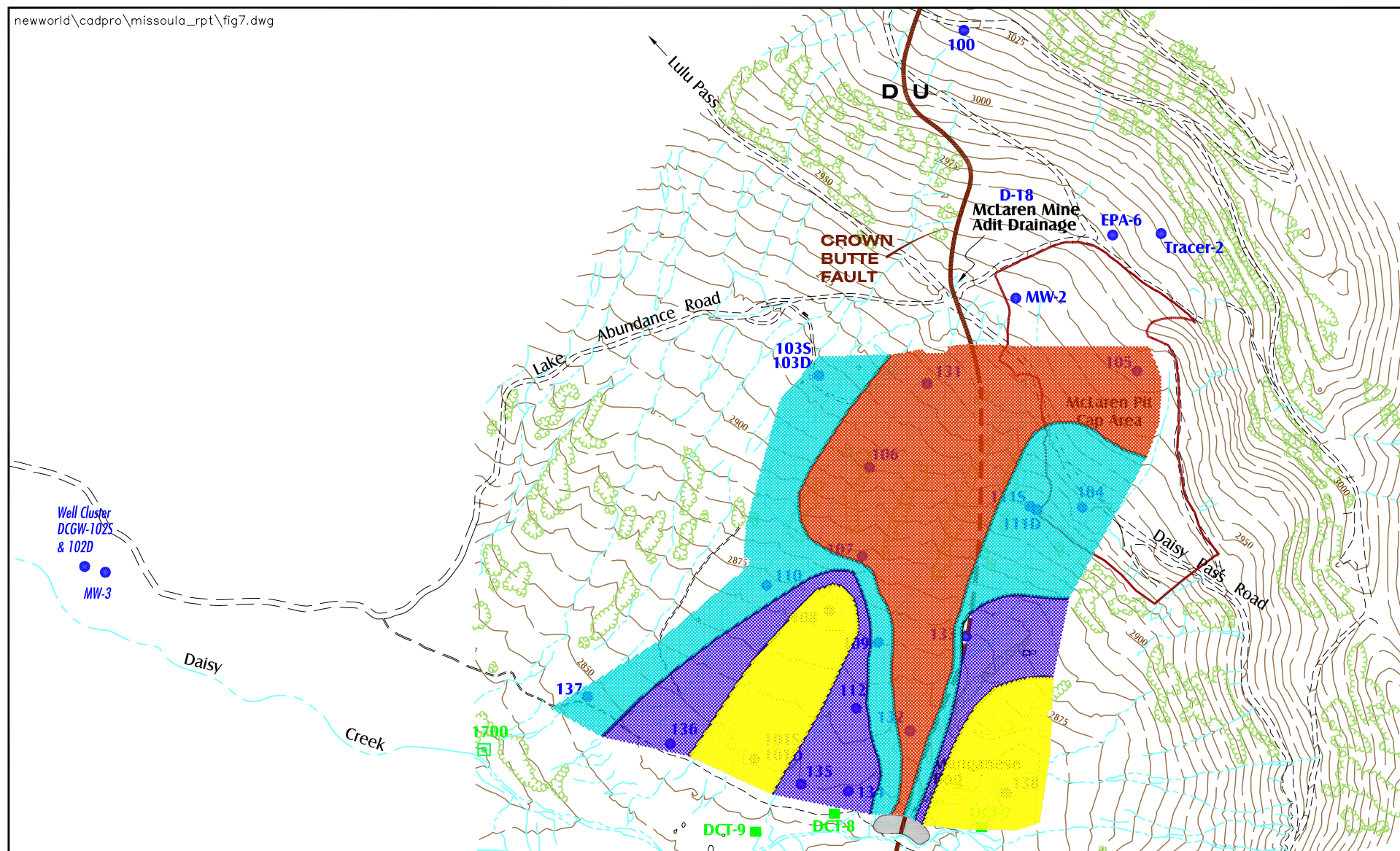
Isopleth Map of Mean Specific Conductance
In Shallow Groundwater - July 2003
McLaren Pit Area
New World Mining District
Response and Restoration Project
Cooke City Area, Montana
FIGURE 5



ORP (millivolts)



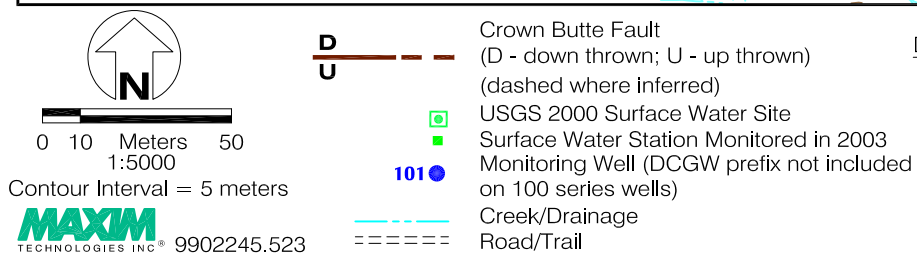
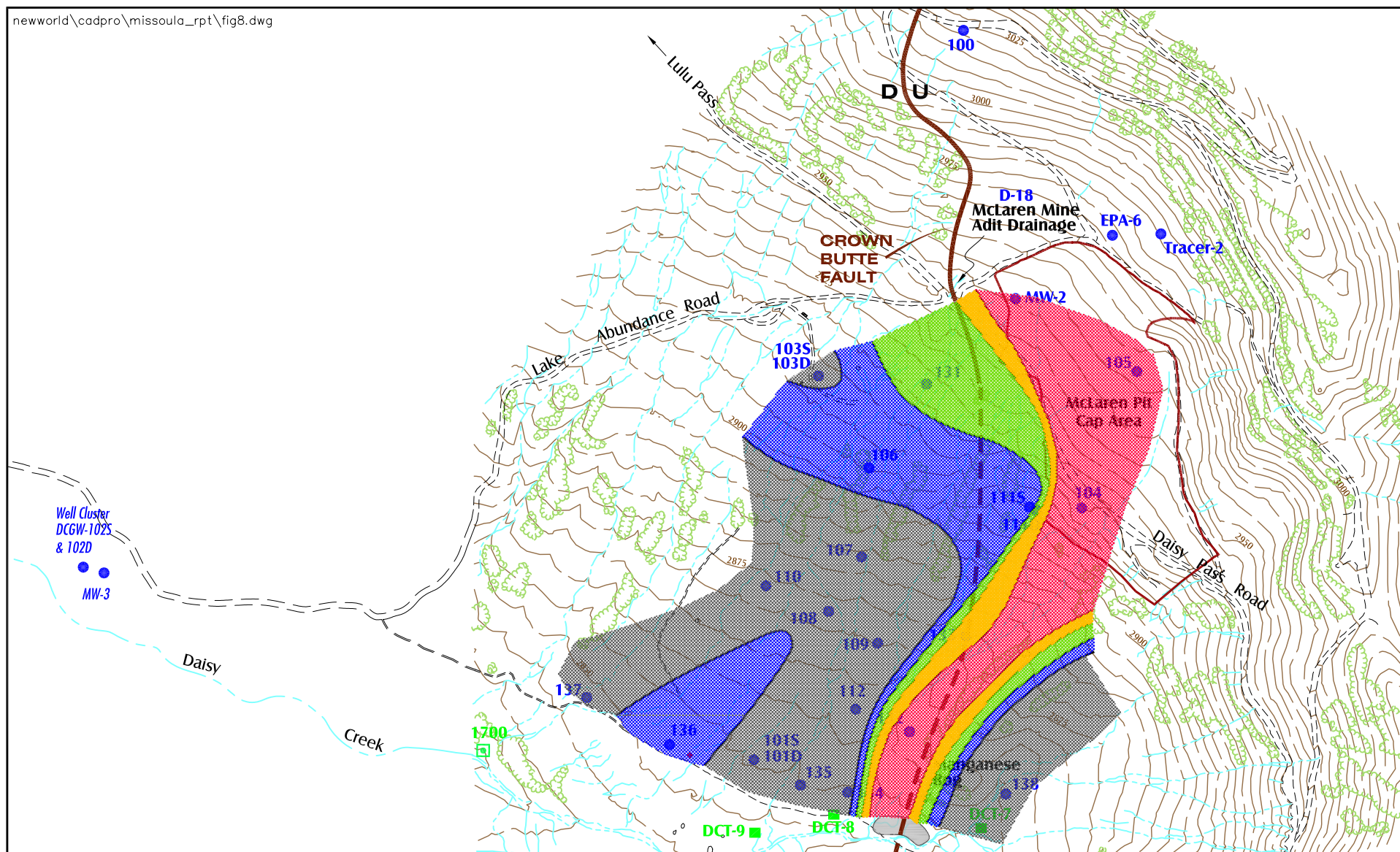
Isopleth Map of Mean Oxidation Reduction Potential
In Shallow Groundwater - July 2003
McLaren Pit Area
New World Mining District
Response and Restoration Project
Cooke City Area, Montana
FIGURE 6



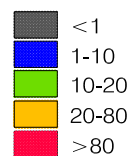
Dissolved Oxygen (milligrams/liter)



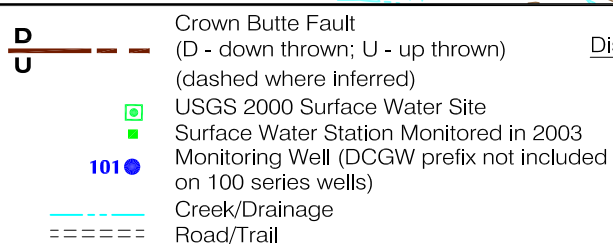
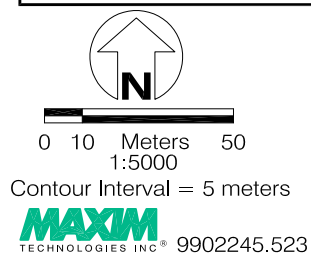
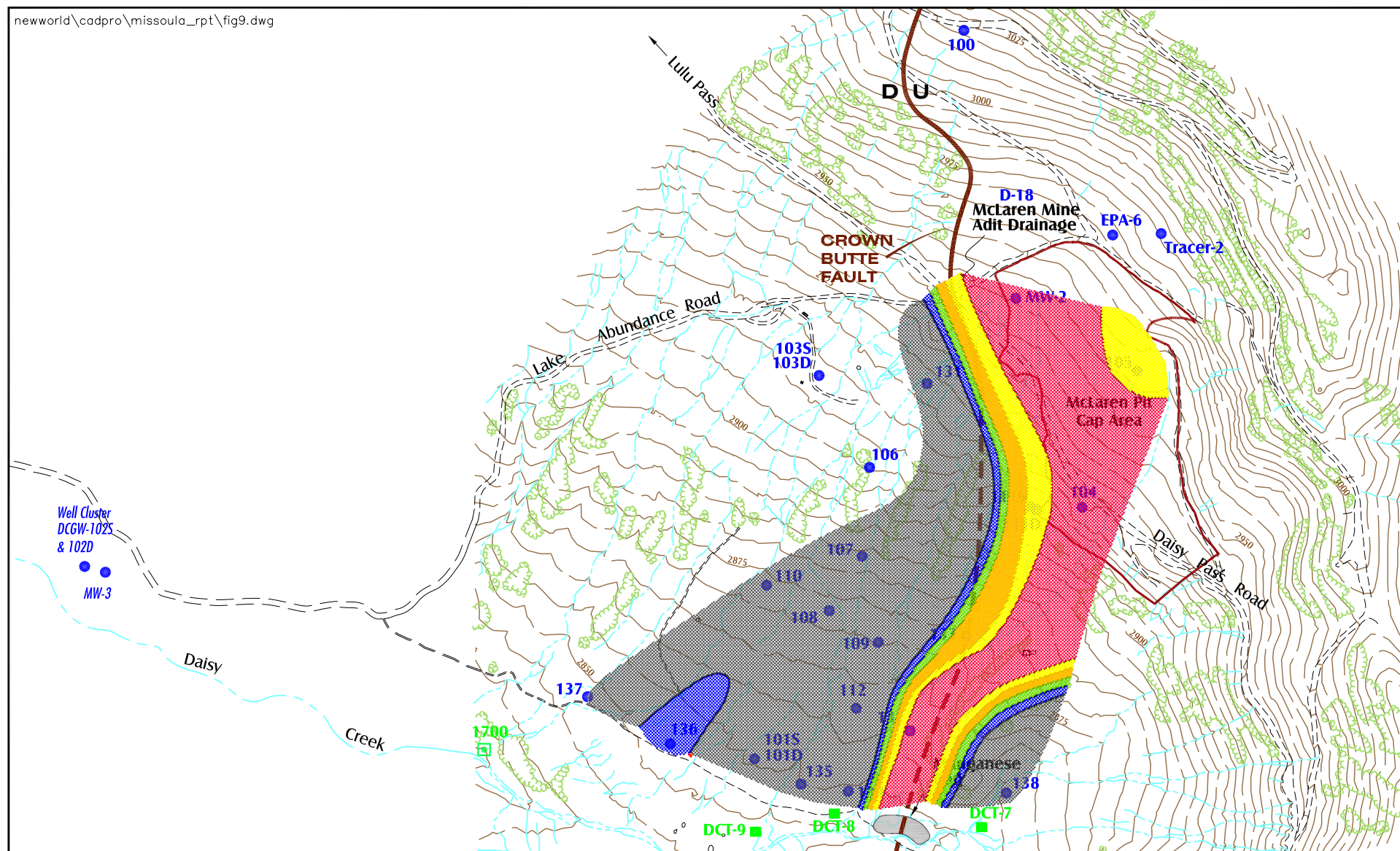
Isopleth Map of Mean Dissolved Oxygen
In Shallow Groundwater - July 2003
McLaren Pit Area
New World Mining District
Response and Restoration Project
Cooke City Area, Montana
FIGURE 7



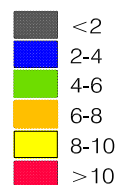
Dissolved Iron (milligrams/liter)



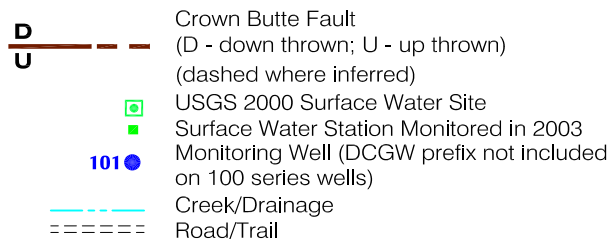
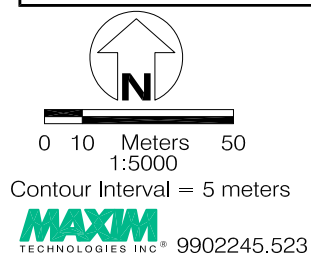
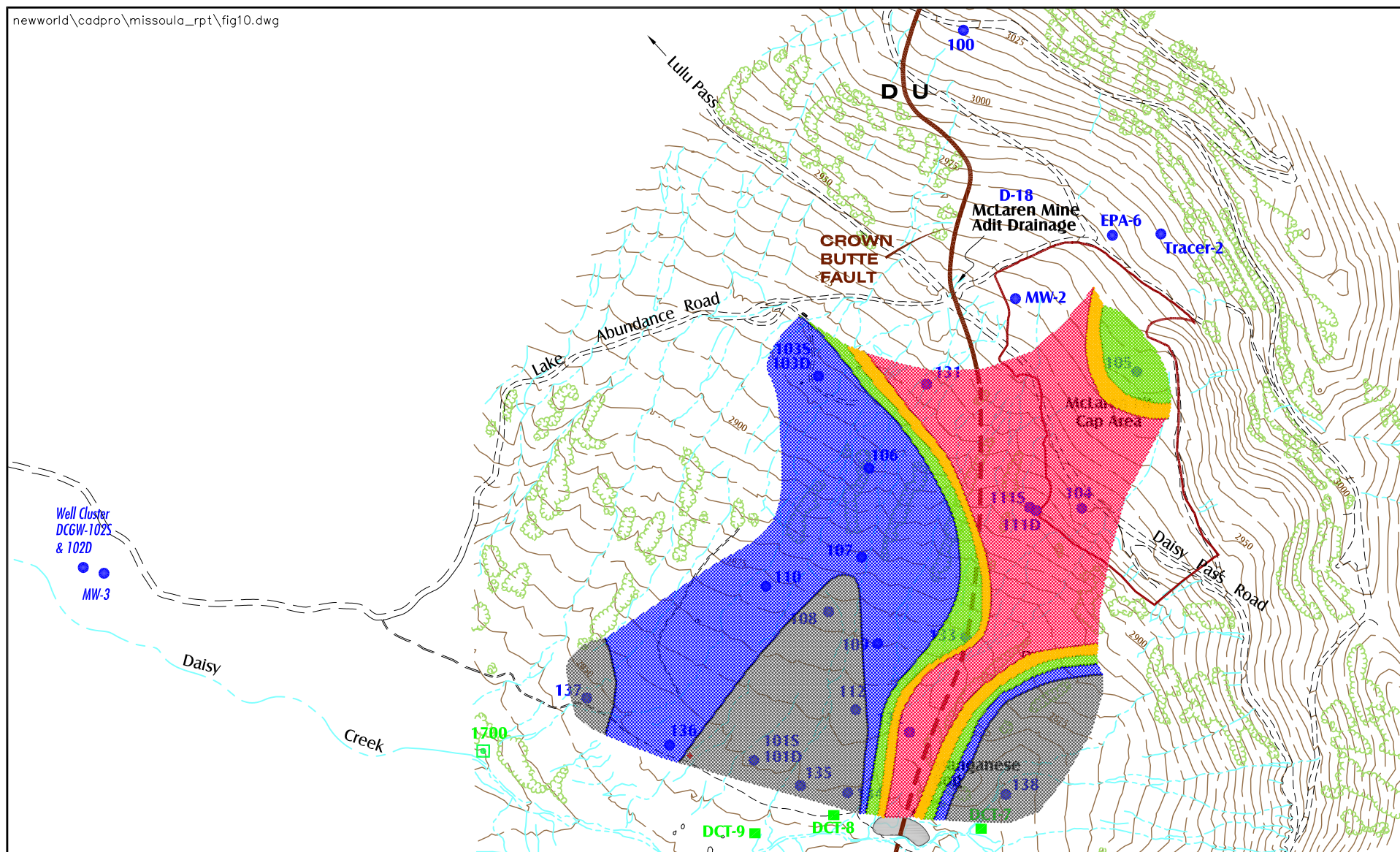
Isopleth Map of Dissolved Iron
In Shallow Groundwater - July 2003
McLaren Pit Area
New World Mining District
Response and Restoration Project
Cooke City Area, Montana
FIGURE 8



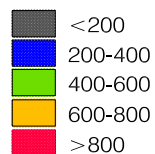
Dissolved Copper (milligrams/liter)



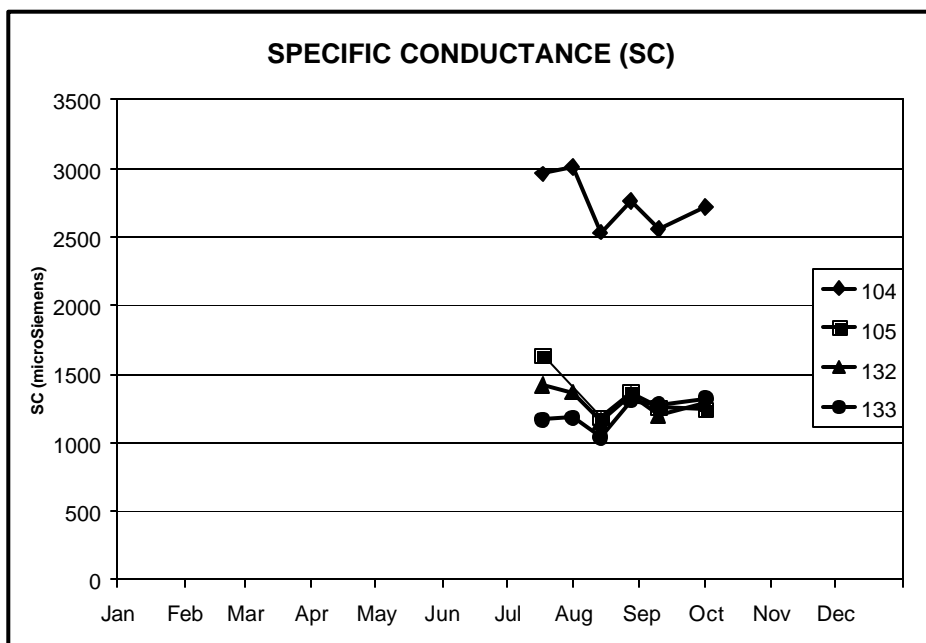
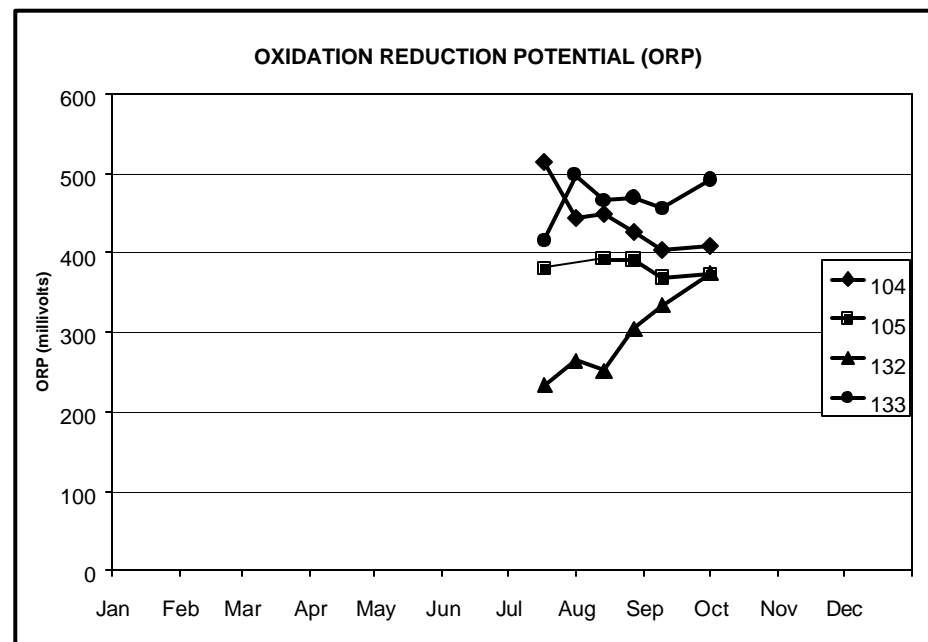
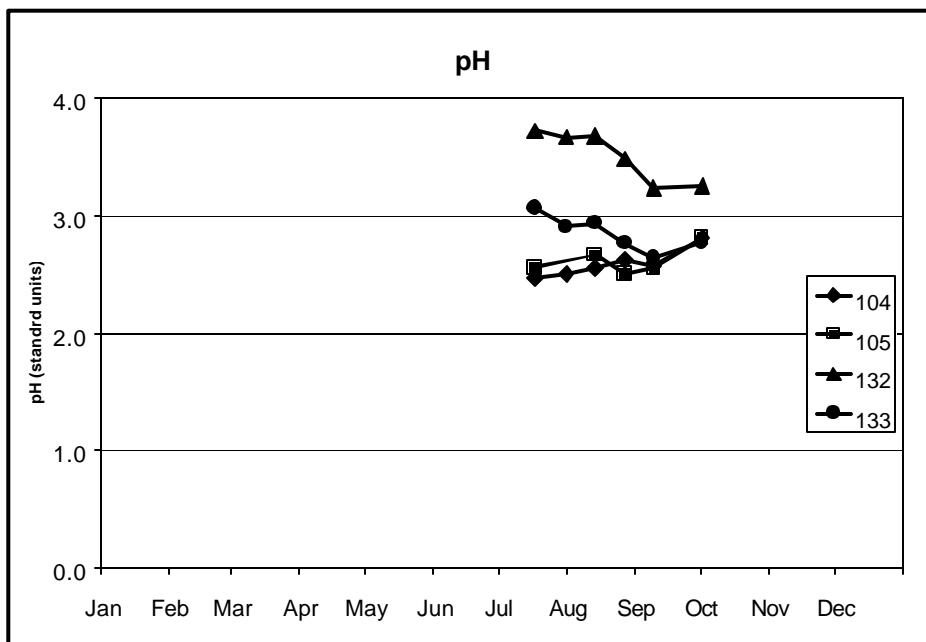
Isopleth Map of Dissolved Copper
In Shallow Groundwater - July 2003
McLaren Pit Area
New World Mining District
Response and Restoration Project
Cooke City Area, Montana
FIGURE 9



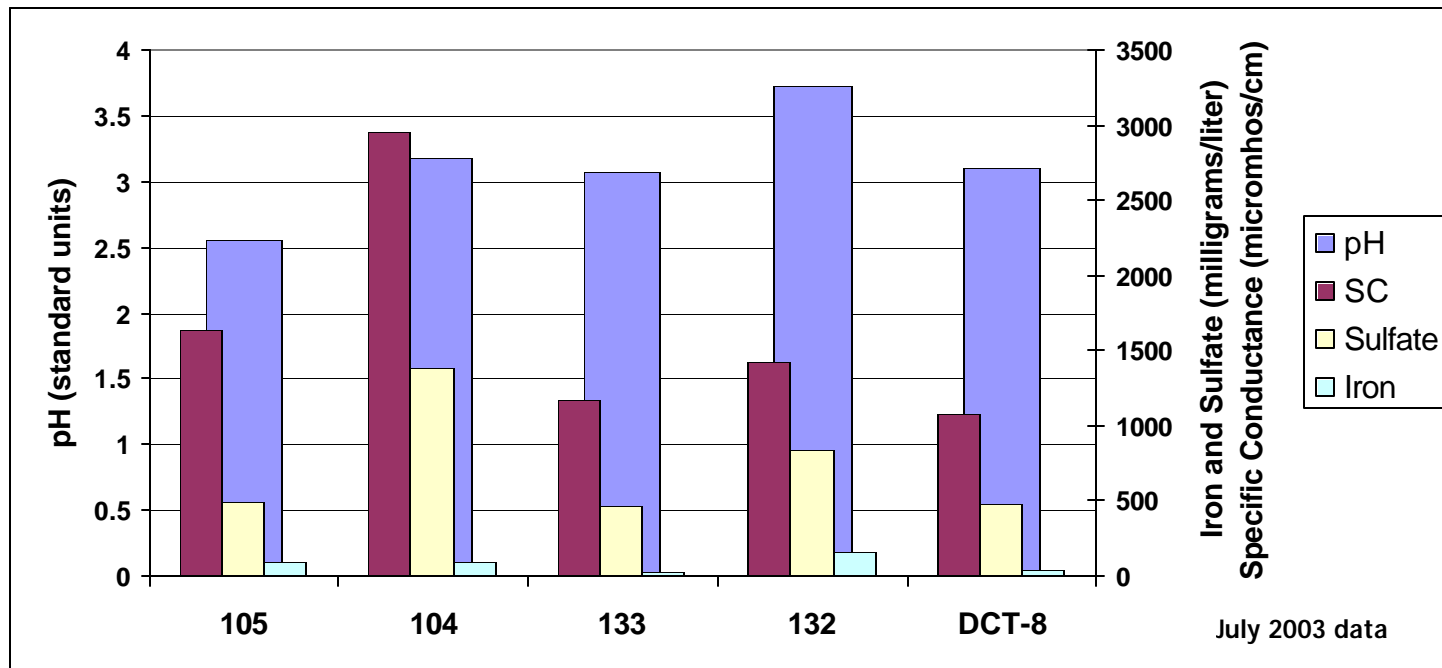
Sulfate (milligrams/liter)



Isopleth Map of Sulfate
In Shallow Groundwater - July 2003
McLaren Pit Area
New World Mining District
Response and Restoration Project
Cooke City Area, Montana
FIGURE 10



pH, ORP, and SC Trends for 2003 in Shallow Wells
 Within the Zone of Poor Water Quality
 McLaren Pit Area
FIGURE 11



Comparison of Selected Constituent Concentrations
Between Selected Shallow Wells and Station DCT-8
McLaren Pit Area
FIGURE 12

ATTACHMENT B

TABLES

McLaren Pit Area 2003 Biweekly Groundwater Monitoring
New World Mining District Response and Restoration Project

TABLE 1
McLAREN PIT MONITORING WELL FIELD PARAMETER DATA - 2002 AND 2003
NEW WORLD MINING DISTRICT RESPONSE AND RESTORATION PROJECT

WELL	DATE	TOTAL DEPTH (feet)	APPROX CASING STICK-UP (feet)	DEPTH TO BEDROCK (feet)	WATER BEARING INTERVAL (feet bgs))	DEPTH TO GROUND WATER (feet)	TEMP (deg. C)	pH (su)	SC (uS)	ORP (mV)	DO (mg/L)	NOTES
TRACER 2	7/8/2002	129.0	ND	ND	ND	18.51	5.0	3.66	732	3.0	NM	4
	7/17/2003					22.64	5.2	3.61	759	297.0	0.44	2
	8/1/2003					30.56	3.0	3.65	543	385.2	0.90	5
	8/11/2003					38.53	2.8	3.45	476	385.8	0.90	5
	8/27/2003					51.44	2.1	3.31	570	405.5	0.74	5
	9/8/2003					59.79	2.3	3.08	567	452.8	0.82	5
	9/30/2003					71.97	3.1	3.25	613	457.1	3.20	3
					2003 Minimum	22.64	2.1	3.08	476	385.2	0.74	
					2003 Maximum	71.97	5.2	3.65	759	452.8	0.90	
					2003 Mean	45.82	3.1	3.39	588	407.3	0.84	
MW- 2	7/9/2002	60.0	ND	ND	ND	Artesian	5.0	3.44	797	89.0	NM	4
	7/17/2003					Artesian	5.3	3.81	785	250.0	0.64	4
	8/1/2003		temp. 5.07			10.34	4.1	3.76	751	286.9	0.67	5
	8/13/2003					10.73	2.9	3.79	632	265.9	0.74	5
	8/27/2003					11.21	2.7	3.70	1,163	282.8	0.87	5
	9/8/2003					11.85	2.9	3.57	732	271.9	0.45	5
	9/30/2003					14.72	2.8	3.86	752	255.3	1.85	5
					2003 Minimum	10.34	2.73	3.57	632	255.3	0.45	
					2003 Maximum	14.72	5.3	3.86	1163	286.9	1.85	
					2003 Mean	11.77	3.46	3.75	802.50	272.6	0.92	
DCGW- 100	8/1/2003	237.0	2.0	13	60	90.91	2.6	6.95	976	42.5	3.80	3 *
	8/11/2003					96.15	6.1	6.82	661	81.5	2.94	3 *
	8/27/2003					113.62	2.9	6.80	565	85.0	1.80	3 *
	9/9/2003					116.47	1.6	7.13	533	109.3	1.51	3
	9/30/2003					120.23	3.2	6.68	547	172.4	2.46	3 *
					Minimum	90.91	1.6	6.68	533	42.5	1.51	
					Maximum	120.23	6.1	7.13	976	172.4	3.80	
					Mean	107.48	3.3	6.88	656	98.1	2.50	
DCGW- 101 S	10/10/2001	14.7	2.6	12	ND (above bedrock contact)	7.70	4.9	5.29	249	260.0	NM	4
	7/10/2002					5.60	4.5	4.51	235	142.0	NM	4
	9/5/2002					6.93	6.5	4.48	223	NM	NM	4
	9/17/2002					6.41	5.0	4.56	187	NM	NM	4
	10/7/2002					6.39	6.0	4.58	235	NM	NM	4
	7/16/2003					6.08	4.5	4.53	255	205.0	8.97	2
	7/31/2003					6.61	3.4	4.07	238	380.4	9.57	4
	8/11/2003					7.07	3.4	4.12	203	495.4	6.93	6 *
	8/27/2003					7.65	3.8	4.40	244	393.7	6.16	6
	9/9/2003					8.02	4.2	4.48	244	321.0	3.23	6 **
	10/1/2003					8.32	4.6	4.55	253	399.0	4.47	6 *
					2003 Minimum	6.08	3.4	4.07	203	321.0	3.23	
					2003 Maximum	8.32	4.55	4.55	255	495.4	6.93	
					2003 Mean	7.29	3.98	4.36	239.50	402.3	5.20	
DCGW- 101 D	10/10/2001	27.4	2.4	12	22	7.38	3.2	6.70	536	258.0	NM	4
	7/10/2002					5.70	4.50	6.12	442	6.0	NM	4
	9/5/2002					7.36	5.1	5.32	382	NM	NM	4
	9/17/2002					6.19	4.0	7.41	303	NM	NM	4
	10/7/2002					6.18	5.0	7.32	406	NM	NM	4
	7/16/2003					4.95	4.5	7.06	418	114.0	4.13	2
	7/31/2003					6.61	2.4	7.20	394	75.6	1.02	6
	8/11/2003					7.01	2.4	6.75	332	300.1	0.78	6 **
	8/27/2003					7.61	2.5	6.62	399	212.5	0.64	6
	9/9/2003					7.98	2.7	6.63	385	202.0	0.48	6
	10/1/2003					8.18	2.9	6.50	437	297.4	0.17	6 *
					2003 Minimum	4.95	2.42	6.50	332.00	75.6	0.17	
					2003 Maximum	8.18	4.50	7.20	437.00	300.1	1.02	
					2003 Mean	7.06	2.92	6.79	394.17	217.5	0.62	

TABLE 1
McLAREN PIT MONITORING WELL FIELD PARAMETER DATA - 2002 AND 2003
NEW WORLD MINING DISTRICT RESPONSE AND RESTORATION PROJECT

WELL	DATE	TOTAL DEPTH (feet)	APPROX CASING STICK-UP (feet)	DEPTH TO BEDROCK (feet)	WATER BEARING INTERVAL (feet bgs))	DEPTH TO GROUND WATER (feet)	TEMP (deg. C)	pH (su)	SC (uS)	ORP (mV)	DO (mg/L)	NOTES
DCGW- 102 S	7/8/2002	31.4	2.4	29	ND	2.71	10.0	7.33	384	NM	NM	4
	2.88					5.8	7.62	398	NM	NM	4	
	4.62					5.0	7.60	380	NM	NM	4	
	7/16/2003					2.49	5.5	7.73	379	141.0	0.68	2
	5.28					5.1	7.37	366	40.0	2.41	5 **	
	3.20					2.9	7.15	306	116.9	2.34	5	
	2.96					3.3	7.21	610	128.3	2.14	5 *	
	2.92					3.0	7.04	367	317.3	1.16	5 *	
	3.17					3.1	7.24	376	110.5	1.43	5 *	
	2003 Minimum					2.49	2.89	7.04	306.00	40.0	1.16	
	2003 Maximum					5.28	5.50	7.73	610.00	317.3	2.41	
	2003 Mean					3.34	3.83	7.29	400.67	142.6	1.90	
	DCGW- 102 D					7/8/2002	57.4	2.4	38	ND	6.67	10.0
6.62		6.0	7.93	406	NM	NM					4	
6.71		4.0	7.80	340	NM	NM					4	
	7/16/2003					6.04	7.0	7.41	379	132.0	3.75	2
	6.17					5.6	7.64	361	65.2	3.51	5 **	
	6.21					3.0	7.40	312	105.0	0.78	5	
	6.22					2.9	7.47	976	101.5	0.83	5	
	6.27					3.0	7.32	370	87.0	0.92	5	
	6.6					2.7	7.52	341	104.9	1.49	5	
	2003 Minimum					6.04	2.67	7.32	312.00	65.2	0.78	
	2003 Maximum					6.60	7.00	7.64	976.00	105.0	3.51	
	2003 Mean					6.25	4.03	7.46	456.50	92.7	1.51	
	MW- 3					9/5/2002	48.9	3.0	22	ND	NM	NM
5.69		5.2	7.62	394	NM	NM					4	
5.77		4.0	7.70	350	NM	NM					4	
	7/16/2003					5.06	6.5	7.68	386	124.0	1.52	2
	5.20					5.3	7.60	358	63.6	1.00	5	
	3.20					2.9	7.40	296	109.2	0.87	5	
	5.19					2.7	7.43	667	98.9	0.91	5 *	
	5.21					2.8	7.43	347	119.2	0.47	5	
	5.61					2.7	7.54	329	102.3	0.87	5	
	2003 Minimum					3.20	2.72	7.40	296.00	63.6	0.47	
	2003 Maximum					5.61	6.50	7.68	667.00	119.2	1.00	
	2003 Mean					4.91	3.82	7.51	397.17	98.6	0.82	
	DCGW- 103 S					7/8/2002	32.7	2.7	40	ND	Artesian	15.00
Artesian		8.0	7.03	563	NM	NM					4	
Artesian		4.0	6.91	718	NM	NM					4	
	7/9/2003					0.01	8.0	6.52	710	70.0	1.12	1
	18.51					3.7	6.81	686	76.5	2.10	4	
	27.65					2.9	6.82	595	-20.6	2.28	6 **	
	27.67					2.9	6.84	729	82.9	3.46	6 **	
	28.41					2.9	6.89	720	108.2	3.04	6 **	
	25.40					3.0	6.53	770	255.6	2.16	6 *	
	2003 Minimum					0.01	2.88	6.52	595.00	-20.6	2.16	
	2003 Maximum					28.41	8.00	6.89	770.00	255.6	3.46	
	2003 Mean					21.28	3.90	6.74	701.67	106.5	2.74	

TABLE 1
McLAREN PIT MONITORING WELL FIELD PARAMETER DATA - 2002 AND 2003
NEW WORLD MINING DISTRICT RESPONSE AND RESTORATION PROJECT

WELL	DATE	TOTAL DEPTH	APPROX CASING STICK-UP	DEPTH TO BEDROCK	WATER BEARING INTERVAL	DEPTH TO GROUND WATER	TEMP	pH	SC	ORP	DO	NOTES	
		(feet)	(feet)	(feet)	(feet bgs))	(feet)	(deg. C)	(su)	(uS)	(mV)	(mg/L)		
DCGW- 103 D	7/8/2002	55.6	2.8	40	ND	Artesian	9.0	6.41	534	0.0	NM	4	
	9/17/2002					Artesian	6.0	7.38	408	NM	NM	4	
	10/7/2002					Artesian	7.0	7.38	499	NM	NM	4	
	7/9/2003					Artesian	7.6	6.76	550	30.0	0.81	1	
	7/31/2003					Artesian	3.1	7.10	534	-13.0	0.74	6 *	
	8/12/2003					Artesian	3.2	7.21	507	-129.7	0.76	6 *	
	8/27/2003					Artesian	3.0	6.97	891	-77.0	0.74	6 *	
	9/10/2003					Artesian	3.0	7.15	498	73.0	0.42	6 *	
	10/1/2003					Artesian	3.0	7.06	611	-6.0	0.24	6 *	
						2003 Minimum		3.00	6.76	498.00	-129.7	0.24	
					2003 Maximum		7.60	7.21	891.00	73.0	0.76		
					2003 Mean		3.82	7.04	598.50	-30.5	0.58		
	DCGW- 104	10/8/2001	26.7	3.4	23.4	ND	NM	NM	NM	NM	NM	NM	
7/9/2002		26.7	3.4			20.28	4.5	2.89	2,890	33.0	NM	4	
9/17/2002		26.7	8.0			23.46	4.0	3.19	2,060	NM	NM	4	
10/7/2002		26.7	8.0			24.67	5.0	3.18	2,480	NM	NM	4	
	7/17/2003	19.5	2.0	Well cut down-reclamation		13.42	5.6	2.47	2,960	515.0	4.61	2	
	7/31/2003	19.5	2.0			12.98	3.3	2.51	3,011	444.3	3.22	4	
	8/13/2003	19.5	2.0			14.10	3.9	2.56	2,535	449.5	2.94	6	
	8/27/2003	19.5	2.0			15.19	3.7	2.63	2,766	426.9	2.55	6	
	9/9/2003	19.5	2.0			15.67	3.9	2.57	2,558	403.5	1.78	6	
	10/1/2003	23.8	2.5			20.41	4.3	2.82	2,721	409.4	3.00	6	
						2003 Minimum	12.98	3.29	2,47	403.5	1.78		
						2003 Maximum	20.41	5.60	3011.00	449.5	3.00		
						2003 Mean	15.30	4.10	2758.50	422.3	2.57		
DCGW- 105	10/8/2001	21.3	2.0	19	ND	NM	NM	NM	NM	NM	NM		
	7/8/2002	21.3				14.12	4.0	2.83	1,832	404.0	NM	4	
	9/17/2002	21.3				17.51	4.5	3.09	1,084	NM	NM	4	
	10/7/2002	21.3				18.36	5.0	3.05	1,253	NM	NM	4	
	7/17/2003	21.3		No Access Casing added on 8/7/03		14.99	2.9	2.56	1,638	380.0	0.43	2	
	7/31/2003	NM				NM	NM	NM	NM	NM	NM	NM	
	8/13/2003	28.7				23.42	2.6	2.67	1,183	392.0	0.86	6	
	8/27/2003	28.7				23.12	2.6	2.51	1,368	391.4	0.81	6 **	
	9/9/2003	28.7				23.69	3.3	2.55	1,254	368.0	0.45	6	
	10/1/2003	28.7				24.83	3.6	2.81	1,244	372.1	0.76	6	
						2003 Minimum	14.99	2.56	1183.00	368.0	0.45		
					2003 Maximum	24.83	3.58	1638.00	392.0	0.86			
					2003 Mean	22.01	2.98	1337.40	380.9	0.72			
DCGW- 106	8/19/2002	47.5	2.5	NI	42.5-44.5	Artesian	NM	7.16	792	NM	NM	4	
	9/5/2002					Artesian	4.1	5.24	744	NM	NM	4	
	9/17/2002					Artesian	4.0	7.21	690	NM	NM	4	
	10/7/2002					Artesian	3.0	7.04	843	NM	NM	4	
	7/10/2003					Artesian	4.5	6.12	883	-28.0	0.26	1	
	7/31/2003	Artesian				3.1	7.00	858	-30.0	0.74	6 *		
	8/12/2003	Artesian				3.1	6.96	734	-74.4	1.03	6 *		
	8/27/2003	Artesian				3.0	6.94	1,211	-22.7	0.57	6 *		
	9/9/2003	Artesian				3.1	6.86	832	-18.0	0.45	6 *		
	10/1/2003	Artesian				3.0	6.93	871	26.3	0.25	6 *		
						2003 Minimum	Artesian	2.96	6.12	734.00	-74.4	0.25	
					2003 Maximum	Artesian	4.50	7.00	1211.00	26.3	1.03		
					2003 Mean	Artesian	3.28	6.80	898.17	-23.8	0.61		

TABLE 1
McLAREN PIT MONITORING WELL FIELD PARAMETER DATA - 2002 AND 2003
NEW WORLD MINING DISTRICT RESPONSE AND RESTORATION PROJECT

WELL	DATE	TOTAL DEPTH (feet)	APPROX CASING STICK-UP (feet)	DEPTH TO BEDROCK (feet)	WATER BEARING INTERVAL (feet bgs))	DEPTH TO GROUND WATER (feet)	TEMP (deg. C)	pH (su)	SC (uS)	ORP (mV)	DO (mg/L)	NOTES
DCGW- 107	8/23/2002	25.0	1.6	24.0	23.0-24.5	10.79	NM	7.25	558	NM	NM	4
	9/5/2002					15.27	4.9	5.39	572	NM	NM	4
	9/18/2002					15.79	4.5	8.02	447	NM	NM	4
	10/7/2002					15.81	4.5	7.72	604	NM	NM	4
	7/10/2003					15.94	4.5	7.03	686	-123.0	2.26	1
	7/31/2003					16.83	3.9	7.74	686	-39.0	1.64	4 *
	8/13/2003					17.34	2.9	6.90	530	-49.8	0.70	6 *
	8/27/2003					17.62	2.7	7.28	663	-14.0	0.65	6 *
	9/9/2003					17.78	3.0	7.41	623	-93.0	0.41	6 *
	10/1/2003					18.29	3.2	7.03	675	38.0	0.31	6 *
					2003 Minimum	15.94	2.73	6.90	530.00	-93.0	0.31	
					2003 Maximum	18.29	4.50	7.74	686.00	38.0	0.70	
					2003 Mean	17.30	3.37	7.23	643.83	-29.7	0.52	
DCGW- 108	8/23/2002	11.1	2.2	11.0	8.5-10.0	10.55	6.5	5.59	204	NM	NM	4
	9/5/2002					7.68	7.0	4.80	1,663	NM	NM	4
	9/18/2002					9.90	9.0	4.33	248	NM	NM	4
	10/7/2002					6.56	6.5	5.47	235	NM	NM	4
	7/9/2003	No further monitoring until 2004				6.49	4.0	4.41	250	209.0	8.88	1
	7/31/2003					8.10	4.3	4.46	250	238.5	9.28	4 **
	8/13/2003					9.60	4.2	4.41	207	472.0	7.82	5
	8/27/2003											
					2003 Minimum	6.49	4.00	4.41	207.00	209.00	7.82	
					2003 Maximum	9.60	4.28	4.46	250.00	472.00	9.28	
					2003 Mean	8.06	4.15	4.43	235.67	306.50	8.66	
DCGW- 109	8/23/2002	17.4	2.4	15.2	6.8	7.72	NM	7.02	669	NM	NM	4
	9/5/2002				10.0-10.7	6.90	8.1	5.22	643	NM	NM	4
	9/18/2002				15.0-15.2	6.76	5.0	7.44	497	NM	NM	4
	10/7/2002					7.16	5.0	7.33	698	NM	NM	4
	7/10/2003					7.03	3.3	6.96	724	61.0	2.91	1
	7/31/2003					7.36	3.8	7.13	676	92.5	3.23	4
	8/13/2003					7.47	3.3	6.95	581	61.9	1.81	6
	8/27/2003					7.51	3.8	6.86	705	184.5	2.10	6 *
	9/9/2003					7.56	4.7	7.22	669	77.4	1.72	6 *
	10/1/2003					7.28	4.9	6.76	715	213.4	1.74	6 *
					2003 Minimum	7.03	3.26	6.76	581.00	61.9	1.72	
					2003 Maximum	7.56	4.94	7.22	724.00	213.4	2.10	
					2003 Mean	7.37	3.97	6.98	678.33	134.3	1.84	
DCGW- 110	8/23/2002	11.1	1.2	9.8	5.0-6.0	6.26	5.5	6.30	953	NM	NM	4
	9/5/2002					6.24	7.0	5.50	963	NM	NM	4
	9/18/2002					6.23	5.5	6.99	707	NM	NM	4
	10/7/2002					6.07	6.0	7.01	1,030	NM	NM	4
	7/9/2003					6.17	NM	5.97	910	116.0	1.17	1
	7/31/2003					6.32	3.8	6.64	1,056	96.3	3.67	4
	8/13/2003					6.31	4.6	6.32	834	173.9	2.04	6
	8/27/2003					6.33	5.0	6.51	1,041	278.5	3.37	6
	9/9/2003					6.30	5.8	6.62	1,013	232.9	1.72	6
	10/1/2003					6.34	6.1	6.46	1,077	391.7	1.57	6 *
					2003 Minimum	6.17	3.79	5.97	834.00	173.9	1.57	
					2003 Maximum	6.34	6.12	6.64	1077.00	391.7	3.37	
					2003 Mean	6.30	5.05	6.42	988.50	269.3	2.18	

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McLAREN PIT MONITORING WELL FIELD PARAMETER DATA - 2002 AND 2003
NEW WORLD MINING DISTRICT RESPONSE AND RESTORATION PROJECT

WELL	DATE	TOTAL DEPTH (feet)	APPROX CASING STICK-UP (feet)	DEPTH TO BEDROCK (feet)	WATER BEARING INTERVAL (feet bgs))	DEPTH TO GROUND WATER (feet)	TEMP (deg. C)	pH (su)	SC (uS)	ORP (mV)	DO (mg/L)	NOTES
DCGW- 111 S	8/12/2003	24.8	1.8	NI	15-23	4.27	2.8	5.99	1,466	130.6	4.07	6
	8/27/2003					4.55	2.9	5.54	1,681	158.0	3.49	6 **
	9/9/2003					4.75	3.5	4.65	1,525	185.1	1.68	6
	10/1/2003					6.06	3.2	5.96	1,764	184.4	1.71	6
					Minimum Maximum Mean	4.27	2.78	4.65	1466.00	130.60	1.68	
						6.06	3.53	5.99	1764.00	185.10	4.07	
						4.91	3.10	5.54	1609.00	164.53	2.74	
DCGW- 111 D	8/12/2003	41.5	1.8	20	Bedrock	10.93	3.2	5.52	1,160	121.9	1.03	6 **
	8/27/2003					10.92	3.0	5.16	1,283	177.6	1.05	6
	9/9/2003					11.51	3.1	4.85	1,266	158.6	0.71	6
	10/1/2003					11.42	3.0	5.42	1,250	170.5	1.07	6 *
					Minimum Maximum Mean	10.92	2.99	4.85	1160.00	121.90	0.71	
						11.51	3.24	5.52	1283.00	177.60	1.07	
						11.20	3.08	5.24	1239.75	157.15	0.97	
DCGW- 112	7/31/2003	36.7	1.7	14	30-35	7.45	3.4	6.65	1,331	33.7	2.96	4
	8/12/2003					7.65	3.2	6.48	1,529	-41.0	0.73	6 *
	8/27/2003					7.87	2.9	6.66	1,813	-157.0	0.99	6 *
	9/9/2003					8.05	3.0	6.58	1,826	-124.0	0.50	6
	10/1/2003					7.96	2.9	6.50	1,696	72.0	0.12	6 *
					Minimum Maximum Mean	7.45	2.9	6.5	1331.0	-157.0	0.12	
						8.05	3.4	6.7	1826.0	72.0	0.99	
						7.80	3.1	6.6	1639.0	-62.5	0.59	
DCGW- 131	8/23/2002	22.3	2.8	NI	20.5-21.0	20.69	4.0	6.36	1,694	NM	NM	4
	9/5/2002					6.58	4.9	5.44	1,685	NM	NM	4
	9/17/2002					6.36	4.0	6.79	1,651	NM	NM	4
	10/7/2002					4.81	4.5	6.67	2,020	NM	NM	4
	7/9/2003					0.07	6.0	6.11	2,200	-39.0	0.35	1
	7/31/2003					1.09	2.8	6.56	2,038	4.6	1.31	6
	8/12/2003					2.40	3.7	6.53	1,667	-11.0	3.29	6
	8/27/2003					3.83	2.9	6.49	1,946	36.6	3.17	6
	9/9/2003					4.38	3.3	6.31	1,880	73.5	2.06	6
	10/1/2003					4.85	3.9	6.41	2,088	76.7	1.38	6 *
					2003 Minimum 2003 Maximum 2003 Mean	0.07	2.83	6.11	1667.00	-11.0	1.31	
						4.85	6.00	6.56	2200.00	76.7	3.29	
						2.77	3.76	6.40	1969.83	36.1	2.24	
	8/23/2002	10.3	1.2	7.0	4.5-10.0+	5.74	6.0	4.22	1,174	NM	NM	4
	9/5/2002					5.63	7.0	3.54	1,233	NM	NM	4
	9/18/2002					5.54	4.7	3.80	965	NM	NM	4
	10/7/2002					5.55	4.5	4.02	1,250	NM	NM	4
	7/10/2003					5.06	3.6	3.73	1,422	233.0	0.77	1
	7/31/2003					5.49	3.0	3.67	1,368	264.3	4.07	6
	8/12/2003					5.66	3.9	3.68	1,155	251.2	1.63	6
	8/27/2003					6.01	4.5	3.49	1,347	304.3	1.40	6
	9/9/2003					6.21	5.9	3.24	1,199	333.5	1.15	6
	10/1/2003					6.19	5.3	3.26	1,286	374.0	2.64	6
					2003 Minimum 2003 Maximum 2003 Mean	5.06	2.95	3.24	1155.00	251.2	1.15	
						6.21	5.88	3.73	1422.00	374.0	4.07	
						5.77	4.34	3.51	1296.17	305.5	2.18	

TABLE 1
McLAREN PIT MONITORING WELL FIELD PARAMETER DATA - 2002 AND 2003
NEW WORLD MINING DISTRICT RESPONSE AND RESTORATION PROJECT

WELL	DATE	TOTAL DEPTH (feet)	APPROX CASING STICK-UP (feet)	DEPTH TO BEDROCK (feet)	WATER BEARING INTERVAL (feet bgs)	DEPTH TO GROUND WATER (feet)	TEMP (deg. C)	pH (su)	SC (uS)	ORP (mV)	DO (mg/L)	NOTES
DCGW- 133	8/23/2002	9.7	1.5	4.2	3.9-4.2+	3.71	8.5	3.75	1,110	NM	NM	4
	9/5/2002					3.96	8.1	2.80	1,289	NM	NM	4
	9/18/2002					3.23	6.5	2.98	901	NM	NM	4
	10/7/2002					3.83	4.5	3.14	1,177	NM	NM	4
	7/10/2003					3.36	5.0	3.07	1,168	415.0	5.80	1
	7/31/2003					3.46	8.8	2.91	1,181	497.6	4.81	6 *
	8/13/2003					3.96	7.3	2.94	1,043	465.1	3.76	6
	8/27/2003					4.23	6.7	2.77	1,310	469.0	2.20	6
	9/9/2003					4.38	7.5	2.64	1,280	455.6	2.71	6
	10/1/2003					4.34	5.6	2.78	1,325	491.3	5.66	6 **
					2003 Minimum	3.36	5.00	2.64	1043.00	455.6	2.20	
					2003 Maximum	4.38	8.75	3.07	1325.00	497.6	5.66	
					2003 Mean	3.96	6.82	2.85	1217.83	475.7	3.83	
DCGW- 134	8/23/2002	9.3	1.7	5.5	4.5-6.5+	4.18	8.2	6.62	258	NM	NM	4
	9/5/2002					4.01	7.0	5.28	386	NM	NM	4
	9/18/2002					3.85	6.0	6.83	289	NM	NM	4
	10/7/2002					3.86	6.0	7.03	395	NM	NM	4
	7/16/2003					3.55	4.0	6.34	411	184.0	5.45	1
	7/31/2003					3.92	3.8	6.69	470	140.0	6.69	4
	8/11/2003					4.08	4.5	6.44	410	235.4	5.73	6 *
	8/27/2003					4.21	4.9	6.53	563	269.0	5.30	6
	9/9/2003					4.24	5.3	6.87	535	147.0	5.77	6
	10/1/2003					4.19	5.4	6.49	589	336.3	5.80	6 *
					2003 Minimum	3.55	3.82	6.34	410.00	147.0	5.30	
					2003 Maximum	4.24	5.37	6.87	589.00	336.3	5.80	
					2003 Mean	4.03	4.65	6.56	496.33	246.9	5.65	
DCGW- 135	8/23/2002	7.4	1.3	4.5	4.0-4.5	Dry	NM	NM	NM	NM	NM	
	9/5/2002					6.35	8.5	5.30	682	NM	NM	4
	9/18/2002					5.20	6.8	6.19	189	NM	NM	4
	10/7/2002					6.04	6.0	6.01	249	NM	NM	4
	7/10/2003					5.79	6.5	5.76	120	190.0	5.49	1
	7/31/2003					6.10	5.9	5.66	151	135.3	5.35	5
	8/11/2003					6.80	NM	NM	NM	NM	NM	8
	8/27/2003					Dry						
					2003 Minimum	5.79	5.90	5.66	120.00	135.30	5.35	
					2003 Maximum	6.80	6.50	5.76	151.00	190.00	5.49	
					2003 Mean	6.23	6.20	5.71	135.50	162.65	5.42	
DCGW- 136	8/23/2002	11.0	2.3	10.0	2.5 ?- 7.5 ?	4.03	6.8	6.96	360	NM	NM	4
	9/5/2002					4.39	6.0	5.01	422	NM	NM	4
	9/18/2002					3.79	6.0	5.38	296	NM	NM	4
	10/7/2002					3.72	6.0	5.60	409	NM	NM	4
	7/10/2003					2.89	4.0	4.76	438	236.0	5.88	1
	7/31/2003					4.09	4.7	5.28	423	263.2	7.16	4
	8/11/2003					4.38	4.5	5.13	362	310.0	5.63	6 **
	8/27/2003					4.87	4.5	5.31	450	335.5	5.68	6
	9/9/2003					4.79	5.4	5.10	380	293.9	5.11	6
	10/1/2003					4.73	4.7	5.53	456	391.5	5.34	6
					2003 Minimum	2.89	4.00	4.76	362.00	293.9	5.11	
					2003 Maximum	4.87	5.39	5.53	456.00	391.5	5.68	
					2003 Mean	4.29	4.63	5.19	418.17	332.7	5.44	

TABLE 1
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NEW WORLD MINING DISTRICT RESPONSE AND RESTORATION PROJECT

WELL	DATE	TOTAL DEPTH (feet)	APPROX CASING STICK-UP (feet)	DEPTH TO BEDROCK (feet)	WATER BEARING INTERVAL (feet bgs)	DEPTH TO GROUND WATER (feet)	TEMP (deg. C)	pH (su)	SC (uS)	ORP (mV)	DO (mg/L)	NOTES
DCGW- 137	8/23/2002	15.5	1.7	10.0	9.8-10	6.46	6.0	5.83	225	NM	NM	4
	9/5/2002				14.0-14.5	4.47	6.0	5.96	265	NM	NM	4
	9/18/2002					3.39	6.0	7.38	182	NM	NM	4
	10/7/2002					3.34	6.0	7.52	246	NM	NM	4
	7/10/2003					3.25	4.0	6.70	235	155.0	0.46	1
	7/31/2003					4.12	2.8	6.77	231	131.8	2.77	6
	8/11/2003					4.44	3.2	6.71	196	210.2	3.23	6 **
	8/27/2003					4.83	3.6	6.81	248	239.1	4.21	6
	9/9/2003					4.72	4.2	6.90	243	202.3	3.05	6
	10/1/2003					4.82	4.7	6.78	258	373.3	3.15	6
					2003 Minimum	3.25	2.80	6.70	196.00	131.8	2.77	
					2003 Maximum	4.83	4.66	6.90	258.00	373.3	4.21	
					2003 Mean	4.36	3.73	6.78	235.17	231.3	3.28	
DCGW- 138	8/23/2002	21.0	2.9	19.5	8.0-21.0+	8.73	5.0	6.74	296	NM	NM	4
	9/5/2002					10.22	6.8	4.92	333	NM	NM	4
	9/18/2002					10.80	4.0	6.58	283	NM	NM	4
	10/7/2002					11.63	4.0	6.73	459	NM	NM	4
	7/10/2003					4.58	3.5	6.15	237	148.0	9.78	1
	7/31/2003					7.60	3.1	5.84	163	202.0	10.52	4
	8/11/2003					8.95	2.4	5.64	207	354.0	9.44	6
	8/27/2003					10.20	2.4	6.00	348	290.8	8.75	6
	9/9/2003					10.94	2.8	6.29	409	158.1	7.30	6 **
	10/1/2003					12.26	3.1	6.04	579	402.5	7.52	6 *
					2003 Minimum	4.58	2.44	5.64	163.00	158.1	7.30	
					2003 Maximum	12.26	3.50	6.29	579.00	402.5	9.44	
					2003 Mean	9.09	2.90	5.99	323.83	301.4	8.25	

Notes:

NI	Not intersected in the drilling	Total Depth (TD) and depth to groundwater measured from top of PVC casing
NM	Not measured	Casing stick-up and depth to bedrock measured from ground surface
ND	Not determined	Water Bearing Interval identified during drilling and measured from ground surface
SC	Specific Conductivity measured in micro siemens/cm	Dashed line separates data previous to 2003
ORP	Oxidation Reduction Potential or Eh measured in millivolts	* ORP measurement continuing to slowly decrease
DO	Dissolved Oxygen measured in milligrams/Liter	** ORP measurement continuing to slowly increase

NOTE AND MONITORING METHOD

- Temperature and DO measurement conducted as pre-purge, downhole measurement, other parameters measured after purging well
- DO measurement conducted as an in-situ, downhole measurement, remainder of parameters measured after purging well
- Sample collected for measurement of field parameters. No purging of well conducted
- Sample collected for measurement of field parameters after purging of well conducted
- All field parameters measured with multiprobe in in-situ, downhole measurement. No purging of well conducted
- All field parameters measured with multiprobe in in-situ, downhole measurement after purging of well conducted
- Depth to groundwater exceeded multiprobe chord length and no sample was collected
- Insufficient water for multiprobe in well

Shading indicates data used to calculate minimum, maximum, and mean for parameter using more than one measurement method
For parameter with no shading, all 2003 data was used to calculate minimum, maximum, and mean

August 11-13 Monitoring	Multiprobe lowered within 5 feet of well bottom or to total cable length (60 feet) when downhole measurement made
August 26-28	Same method as above

TABLE 2
GROUNDWATER ANALYTICAL DATA SUMMARY
NEW WORLD MINING DISTRICT RESPONSE AND RESTORATION PROJECT
McLaren Pit Area

Page 1 of 2

Station Name	Sample Date	Depth to Water (feet)	Anions (mg/L)					Cations (mg/L)								Total Dissolved Metals (mg/L)							
			Acid- idity as CaCO3	Alkalinity as			Chlor- ide	Sulfate	Calcium	Hard- ness as CaCO3	Magne- sium	Potass- ium				Sod- ium	SC (umhos/ cm)	pH (s.u.)	Total Dis- solved Solids (mg/L)	Alum- inum	Cad- mium	Copper	Iron
				HCO3	CO3	Total CaCO3																	
				Groundwater Standard**																			
NA	0.005	1.3	0.3	0.015	0.05	2.0																	
McLaren Pit Area																							
DCGW-100	8/19/2003	99.61	<2	124	0	102	<4	218	104	326	16	2	5	589	7.6	462	<0.05	<0.0001	<0.001	0.01	<0.001	0.41	<0.01
DCGW-101D	7/10/2003	4.95	<2	91	0	74	<2	129	60	191	10	2	4	392	7.8	285	<0.05	<0.0001	<0.001	0.04	<0.001	0.34	<0.01
DCGW-101DX	7/10/2003	--	<2	86	0	71	<2	130	60	191	10	2	3	381	7.8	267	<0.05	<0.0001	<0.001	0.04	<0.001	0.35	<0.01
DCGW-101S	7/16/2003	6.08	25	<1	0	<1	<2	96	26	88	5	1	2	230	4.5	JF%115	2.27	0.0004	0.11	0.02	0.002	0.2	0.07
DCGW-102D	7/16/2003	6.04	<2	258	0	212	<2	27	46	183	17	2	6	334	7.7	JF%133	0.1	<0.0001	<0.001	0.1	<0.001	0.3	<0.01
DCGW-102S	7/16/2003	2.49	<2	210	0	172	<2	37	52	189	15	3	4	344	7.5	JF%174	0.22	0.0002	0.005	0.81	0.01	0.4	<0.01
DCGW-103D	7/9/2003	Artesian	<2	212	0	174	<2	150	96	297	14	8	6	567	7.5	361	<0.05	<0.0001	<0.001	0.41	<0.001	0.2	<0.01
DCGW-103S	7/9/2003	0.01	<2	221	0	181	<2	230	116	360	17	10	8	664	7	475	<0.05	0.0004	<0.001	0.01	<0.001	1.08	0.08
DCGW-104	7/17/2003	13.42	557	<1	0	<1	3	1380	171	632	50	<1	3	2520	2.6	JF%2150	82.8	0.019	35.4	91.8	0.001	10.4	3.47
DCGW-105	7/17/2003	14.99	488	<1	0	<1	2	495	14	61	7	2	3	1190	2.8	JF%796	23.2	0.0033	9.74	116	0.015	1.05	0.47
DCGW-106	7/10/2003		<2	258	0	212	<2	299	151	496	29	3	8	818	7.3	589	<0.05	<0.0001	<0.001	2.25	<0.001	0.19	<0.01
DCGW-107	7/10/2003	15.94	<2	126	0	103	<2	246	95	295	14	9	22	637	7.9	423	<0.05	0.0001	0.001	0.02	<0.001	0.62	<0.01
DCGW-108	7/9/2003	6.49	25	6	0	5	<2	125	29	97	6	2	3	273	4.4	J169	1.49	0.0007	0.43	0.11	<0.001	0.39	0.13
DCGW-109	7/10/2003	7.03	<2	161	0	132	<2	246	116	356	16	5	6	698	7.7	478	<0.05	<0.0001	<0.001	0.03	<0.001	1.61	<0.01
DCGW-110	7/9/2003	6.17	<2	149	0	122	<2	392	153	464	20	5	5	838	7.1	621	<0.05	0.0011	0.014	<0.01	<0.001	7.01	0.04
DCGW-111-D	8/12/2003	10.93	133	11	0	9	<2	938	266	789	41	10	6	1430	5.1	1420	9.81	0.027	12.7	39.9	0.009	JF%8.58	2.85
DCGW-111-S	8/12/2003	4.27	37	11	0	9	<2	954	354	1050	40	7	5	1640	5.5	1490	3.8	0.033	8.65	4.2	0.003	JF%8.17	3.86
DCGW-112	7/31/2003	7.45	<2	129	0	106	4	675	251	800	42	9	22	1260	7	1100	<0.05	0.0005	0.002	2.76	<0.001	3.25	0.09
DCGW-131	7/9/2003	0.07	<2	264	0	216	<2	1260	574	1570	33	25	11	2110	6.7	1970	1.15	0.0002	0.021	11.5	0.005	5.22	0.01
DCGW-132	7/10/2003	5.06	551	<1	0	<1	<2	840	95	365	31	5	4	1830	3.1	1190	38	0.016	12.4	157	0.006	5.64	2.05
DCGW-133	7/10/2003	3.36	261	<1	0	<1	<2	462	64	217	14	3	3	1160	2.9	602	19.5	0.0079	6.48	28.9	0.006	2.5	0.96
DCGW-134	7/16/2003	3.55	<2	72	0	59	<2	114	51	169	10	2	3	328	7.2	JF%148	0.53	0.0001	0.014	0.47	<0.001	0.086	<0.01

Notes:

** - MDEQ Circular WQB-7 Human Health Standard
s.u. - Standard units
mg/L - Milligrams per liter
R - Rinsate blank
X - Field duplicate
S - Shallow well
D - Deep well
umhos/cm - micromhos per centimeter


-- - Indicates parameter not analyzed
< - Indicates analyte not detected above practical quantitation limit (PQL)
J - The associated values are laboratory estimates
JF% - The associated values are estimated quantities because field duplicate results exceed acceptable limits by relative percent difference determination
NA - Not available
 - Shading indicates exceedance of standard

TABLE 2
GROUNDWATER ANALYTICAL DATA SUMMARY
NEW WORLD MINING DISTRICT RESPONSE AND RESTORATION PROJECT
McLaren Pit Area

Page 2 of 2

Station Name	Sample Date	Depth to Water (feet)	Anions (mg/L)						Cations (mg/L)									Total Dissolved Metals (mg/L)						
			Acid- idity as CaCO3	Alkalinity as			Chlor- ide	Sulfate	Calcium	Hard- ness as CaCO3	Magne- sium	Potass- ium	Sod- ium	SC (umhos/ cm)	pH (s.u.)	Total Dis- solved Solids (mg/L)	Alum- inum	Cad- mium	Copper	Iron	Lead	Manga- nese	Zinc	
				HCO3	CO3	Total CaCO3																		
				Groundwater Standard**																				
NA	0.005	1.3	0.3	0.015	0.05	2.0																		
DCGW-135	7/10/2003	5.79	<2	29	0	24	<2	44	18	61	4	3	1	156	6.8	92	<0.05	0.0002	0.006	0.03	<0.001	1.51	<0.01	
DCGW-136	7/10/2003	2.89	46	6	0	5	<2	207	53	174	10	1	2	421	4.5	281	7.91	0.003	2.08	3.46	0.047	1.11	0.39	
DCGW-137	7/10/2003	3.25	<2	109	0	89	<2	43	36	110	5	6	7	223	8	144	0.2	<0.0001	0.002	0.25	0.002	0.15	<0.01	
DCGW-138	7/10/2003	4.58	<2	43	0	35	<2	76	38	120	6	5	3	219	6.9	135	0.12	0.0005	0.003	0.17	0.004	0.017	0.15	
MW-2	7/17/2003	Artesian	392	<1	0	<1	<2	372	21	79	7	4	3	956	4	JF%678	37.4	0.0013	<0.001	90.6	0.009	1.1	0.24	
MW-2X	7/17/2003	--	396	<1	0	<1	<2	396	21	79	6	4	3	988	3.9	JF%680	37.6	0.0012	0.002	88.5	0.009	1.12	0.23	
DCGW-MW-3	7/16/2003	5.06	<2	249	0	204	<2	36	58	227	20	11	4	331	7.6	JF%115	<0.05	<0.0001	<0.001	0.02	<0.001	0.22	<0.01	
Tracer 2	7/17/2003	22.64	422	<1	0	<1	<2	385	7	41	6	4	3	897	3.7	JF%634	50.4	0.0009	3.31	59.7	<0.001	0.41	0.14	

Notes:

** - MDEQ Circular WQB-7 Human Health Standard
s.u. - Standard units
mg/L - Milligrams per liter
R - Rinsate blank
X - Field duplicate
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
-- - Indicates parameter not analyzed
< - Indicates analyte not detected above practical quantitation limit (PQL)
J - The associated values are laboratory estimates
JF% - The associated values are estimated quantities because field duplicate results exceed acceptable limits by relative percent difference determination
NA - Not available
 - Shading indicates exceedance of standard

TABLE 3
SURFACE WATER ANALYTICAL DATA SUMMARY
NEW WORLD MINING DISTRICT RESPONSE AND RESTORATION PROJECT
McLaren Pit Area

Page 1 of 1

Station Name	Sample Date	Flow Rate (cfs)	Anions (mg/L)				Cations (mg/L)								Total Recoverable Metals (mg/L)								
			Acid-ity as CaCO3	Alkalinity as		Chlor-ide	Sulfate	Calcium	Hard-ness as CaCO3	Magne-sium	Potass-ium	Sod-ium	SC (umhos/cm)	pH (s.u.)	Total Sus-pended Solids (mg/L)	Alum-inum	Arsenic	Cad-mium	Copper	Iron	Lead	Manga-nese	Zinc
				HCO3	Total CaCO3																		
Drainage: Daisy Creek																							
DCT-7	7/9/2003	0.33	<2	32	26	<4	107	40	121	5	<1	1	274	6.5	<4	0.49	--	0.0033	0.44	<0.05	<0.001	0.41	0.52
DCT-7	10/1/2003	0.045	<2	60	49	<1	121	d62	180	d6	<d1	d1	337	7.2	<4	0.11	--	0.0008	0.17	0.05	<0.001	0.22	0.22
DCT-8	7/9/2003	0.028	253	<1	<1	<4	485	92	292	15	2	5	1080	3.1	20	27.1	--	0.0049	7.76	19.9	0.006	3.04	0.78
DCT-8	10/1/2003	0.033	437	<1	<1	4	756	d129	450	d31	d3	d4	1410	3.1	18	44.5	--	0.011	13.4	35.4	0.009	5.98	1.87
DCT-9	7/9/2003	0.025	69	<1	<1	<4	164	35	104	4	1	1	424	3.5	<2	7.6	--	0.0006	0.66	2.45	0.003	0.42	0.08
DCT-9	10/1/2003	Dry	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
USGS-1700	7/9/2003	1.11	61	<1	<1	<4	210	54	180	11	2	4	542	3.5	18	6.23	--	0.0014	1.77	11	0.015	0.98	0.16
USGS-1700	10/1/2003	Dry	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:

cfs - Cubic feet per second
s.u. - Standard units
mg/L - Milligrams per liter
X - Field duplicate
umhos/cm - micromhos per centimeter

-- - Indicates parameter not analyzed
< - Indicates analyte not detected above practical quantitation limit (PQL)
d - The associated values are dissolved, not total recoverable

ATTACHMENT C

2003 MONITORING WELL LITHOLOGIC AND COMPLETION LOGS
McLaren Pit Area 2003 Biweekly Groundwater Monitoring
New World Mining District Response and Restoration Project

MONITORING WELL LITHOLOGIC AND COMPLETION LOG

MAXIM TECHNOLOGIES INC.- ENGINEERING AND ENVIRONMENTAL CONSULTING SERVICES

JOB NO.: 9902245	PROJECT: New World Response and Restoration	WELL NO.: DCGW-100
LOCATION AT SITE: Above McLaren Pit, upgradient well screened in Meagher L/S	LOGGED BY: M F Pearson	
LEGAL DESCRIPTION:	DRILLING CONTRACTOR: O'Keefe Drilling	
BOREHOLE DIAMETER (in.): 8	DATE STARTED - DATE COMPLETED: 7/29/03 - 7/30/03	WELL CASING: 2" PVC
	DRILLING METHOD: rotary - reverse circulation	WELL SCREEN: 0.020" PVC
TOTAL WELL DEPTH (feet): 44.5	MEASURING POINT: North side PVC	SAND PACK: #10-20 Silica Sand
DEPTH TO WATER: 67'	HEIGHT ABOVE GROUND SURFACE (feet): 2.0	SEALANTS: Bentonite Chips
MEASUREMENT DATE: 7/30/2003	ELEVATION (feet):	Quicrete Concrete
		WELL PROTECTOR: 6" stick-up steel

Remarks:

DEPTH (feet)	SAMPLE INTERVAL (feet)	SAMPLE TYPE	SUBSURFACE LITHOLOGIC DESCRIPTION	WELL COMPLETION LOG
				Measurements in feet below ground surface:
				Stick up well protector : +2
0.0		cuttings	Talus. Set steel casing to 15' bgs	Concrete 0-2
13.0		cuttings	Gray and black siltstone - Park Shale	Bentonite & Cuttings 2-85
60.0		cuttings	Water encountered. Carbonate and chlorite on fractures and in matrix	
		cuttings		
105.0		cuttings	Hole diameter reduced from 8 to 6 inches	Bentonite Chips 85-175
165.0		cuttings	Meagher Limestone intercepted with quartz/sericite/pyrite alteration, granular texture, and epidote replacements as alteration product	
235.0			TD	Silica Sand 175-235
				Screen 185-235
				Cap 235
				Bottom 235

MONITORING WELL LITHOLOGIC AND COMPLETION LOG

MAXIM TECHNOLOGIES INC.- ENGINEERING AND ENVIRONMENTAL CONSULTING SERVICES

JOB NO.: 9902245	PROJECT: New World Response and Restoration	WELL NO.: DCGW-111-S
LOCATION AT SITE: SW corner of McLaren Pit Cap Area, adjacent to DCGW-111-D	LOGGED BY: M F Pearson	
LEGAL DESCRIPTION:	DRILLING CONTRACTOR: O'Keefe Drilling	
BOREHOLE DIAMETER (in.): 8	DATE STARTED - DATE COMPLETED: 8/6/03 - 8/7/03	WELL CASING: 2" PVC
	DRILLING METHOD: rotary - reverse circulation	WELL SCREEN: 0.020" PVC
TOTAL WELL DEPTH (feet): 23.0	MEASURING POINT: North side PVC	SAND PACK: #10-20 Silica Sand
DEPTH TO WATER: 4.27	HEIGHT ABOVE GROUND SURFACE (feet): 1.8	SEALANTS: Bentonite Chips
MEASUREMENT DATE: 8/12/2003	ELEVATION (feet):	Quicrete Concrete
		WELL PROTECTOR: 6" stick-up steel
Remarks: Well developed using disposable bailer		

DEPTH (feet)	SAMPLE INTERVAL (feet)	SAMPLE TYPE	SUBSURFACE LITHOLOGIC DESCRIPTION	WELL COMPLETION LOG
				<u>Measurements in feet below ground surface:</u> Stick up well protector : +1.8 Concrete 0-1.5 Bentonite Chips 1.5-11 Silica Sand 11-23 Screen 13-23 Cap 23 Bottom 23
0.0		cuttings	Wolsey shale fragments and gray-brown cuttings moist	
5.0			Brown colluvium material, very moist, clayey	
15.0		cuttings	Dark olive-green, clayey material, very moist, Wolsey shale fragments	
20.0			Cont'd green, clayey material with incr. Moisture	
21.5			Harder drilling, cont'd green, clayey material	
23.0			Wet at base of borehole in green, clayey material	
			TD	

MONITORING WELL LITHOLOGIC AND COMPLETION LOG

MAXIM TECHNOLOGIES INC.- ENGINEERING AND ENVIRONMENTAL CONSULTING SERVICES

JOB NO.: 9902245	PROJECT: New World Response and Restoration	WELL NO.: DCGW-111-D
LOCATION AT SITE: SW corner of McLaren Pit Cap Area	LOGGED BY: M F Pearson	
LEGAL DESCRIPTION:	DRILLING CONTRACTOR: O'Keefe Drilling	
BOREHOLE DIAMETER (in.): 8	DATE STARTED - DATE COMPLETED: 8/6/03 - 8/6/03	WELL CASING: 2" PVC
	DRILLING METHOD: rotary - reverse circulation	WELL SCREEN: 0.020" PVC
TOTAL WELL DEPTH (feet): 40.0	MEASURING POINT: North side PVC	SAND PACK: #10-20 Silica Sand
DEPTH TO WATER: 10.93	HEIGHT ABOVE GROUND SURFACE (feet): 1.8	SEALANTS: Bentonite Chips
MEASUREMENT DATE: 8/12/2003	ELEVATION (feet):	WELL PROTECTOR: 6" stick-up steel
Remarks: Well developed using disposable bailer		

DEPTH (feet)	SAMPLE INTERVAL (feet)	SAMPLE TYPE	SUBSURFACE LITHOLOGIC DESCRIPTION	WELL COMPLETION LOG
				Measurements in feet below ground surface:
				Stick up well protector : +1.8
0.0		cuttings	Colluvium. Wolsey shale fragments, moist	Bentonite & Cuttings 1-5
5.0		cuttings	Incr. Moisture	Bentonite Chips 5-23.5
16.0		cuttings	Green, clayey material with rock chips, incr. moisture	
20.0		cuttings	Contact with bedrock: Wolsey shale, tr.pyrite hard drilling, decr. Moisture	
40.0			TD	Silica Sand 23.5-40 Screen 25-40
				Cap 40
				Bottom 40

MONITORING WELL LITHOLOGIC AND COMPLETION LOG

MAXIM TECHNOLOGIES INC.- ENGINEERING AND ENVIRONMENTAL CONSULTING SERVICES

JOB NO.: 9902245	PROJECT: New World Response and Restoration	WELL NO.: DCGW-112
LOCATION AT SITE: Downslope area west of DCGW-132	LOGGED BY: M F Pearson	
LEGAL DESCRIPTION:	DRILLING CONTRACTOR: O'Keefe Drilling	
BOREHOLE DIAMETER (in.): 8	DATE STARTED - DATE COMPLETED: 7/30/03 - 7/31/03	WELL CASING: 2" PVC
	DRILLING METHOD: rotary - reverse circulation	WELL SCREEN: 0.020" PVC
TOTAL WELL DEPTH (feet): 35.0	MEASURING POINT: North side PVC	SAND PACK: #10-20 Silica Sand
DEPTH TO WATER: 6.45	HEIGHT ABOVE GROUND SURFACE (feet): 1.65	SEALANTS: Bentonite Chips
MEASUREMENT DATE: 7/31/2003	ELEVATION (feet):	Quicrete Concrete
		WELL PROTECTOR: 6" stick-up steel

Remarks: Well developed using disposable bailer

DEPTH (feet)	SAMPLE INTERVAL (feet)	SAMPLE TYPE	SUBSURFACE LITHOLOGIC DESCRIPTION	WELL COMPLETION LOG
				Measurements in feet below ground surface:
				Stick up well protector : +1.7
0.0		cuttings	Colluvium: brown, slightly moist, variety of rock fragments	Bentonite Chips 0-9
				Bentonite Chips & Cuttings 9-16
14.0		cuttings	Color change to light gray. Altered intrusive rock: rhyodacite porphyry. Cuttings are moist	Bentonite Chips 16-20
				Silica Sand 20-35
				Screen 25-35
35.0			TD	Cap 35
				Bottom 35

